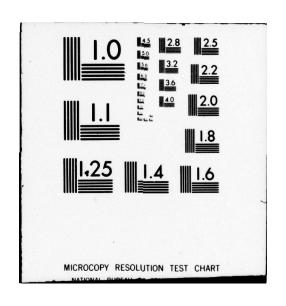
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MEMORANDUM REPORT ARBRL-MR-02942

METEOROLOGICAL MEASUREMENTS PROGRAM
DURING UNIFIED NAVY FIELD TEST PROGRAM

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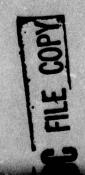
John M. Evans John W. Kinch John H. McNeilly

August 1979





US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
BALLISTIC RESEARCH LABORATORY
ABERDEEN PROVING GROUND, MARYLAND



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INCLASSIFIED UNCLASSIFIED SECURITY CLASSIFICATION OF THIS PAGE(When Date Entered) at several fixed points, strength of atmospheric optical turbulence, net and total solar radiation, temperature, dew point, and relative humidity. This report describes the measurement and recording techniques of the meteorological parameters, and presents the data obtained. METEOROLOGICAE MEASUREMENTS PROGRAMMENTO WIFTED MAYS FIELD TEST PROGRAMS. PARENCE TROPES COO DELECTOR NURSEALW TRANSPORT FERS TROS TO John W. Winch John John Americans and appears U.S. AAmey Ballistic Research baporatory harmon siers kontant 505 (200-81/9) Aderdeen Proving Ground, *C 21005 Cress Modern Alegario Trabaga Lord Ede do the 28M 375 38 27 17 1805 UT U.S. Army Bullistic Research Laboratory STORE POST PROTE trops vive to real or thirties at CONTRACTOR OF THE PROPERTY OF OKOLASSIPTED STILL PROTECTION THE PROTECTION OF THE DESTREETION STATEMENT OF MAR RAPORD Approved for public release: discribition not beyongth DISTRIBUTION STATEMENT (of the Course) solves to diack 20, it offices them Report) IS SUPPLEMENTARY WOTES ACCESSION for White Section MTIS Ruff Section П DDC 0 UNANNOUNCED s. XEV WORDS (Continued not experses visit of inclusions and intentilly by Block non-bas) JUSTIFICATION . meteorological history optical turbulenco micromerecruismy laser propagation DISTRIBUTION/AVAILABILITY CODES AVAIL and/or SPECIAL Constant Model of Plantil has measured to the everyor as subtimes TEATTERS . O The Milliothe Resource Laboratory West participa Froid Test Program Committed at the The Capietrane les Of from the fall of 1976-May 1978. Part of the BRI's crogram was to provide the meteorological mensuremonts measurements provided the data required to determine potinum him him

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PREFACE

During the spring and summer of 1974 and 1975, the Ballistic Research Laboratory (BRL) was a participant in high energy chemical laser experimental programs at TRW's Capistrano Test Site near San Clemente, CA. These programs were concerned with both basic and applied research in chemical laser technology. The 1974 effort was an effects and propagation test known as the BDL Phase II Test Series. BDL is an acronym for Baseline Demonstration Laser, a device designed and constructed by TRW to demonstrate the feasibility of a high power chemical laser.

Because of the greater than anticipated success of the BDL, the Navy and the Advanced Research Projects Agency (ARPA) elected to proceed immediately into the development of a second generation chemical laser. They contracted with TRW for the design and construction of the Navy ARPA Chemical Laser (NACL) which yielded sufficient output power to allow more realistic high energy laser experimental programs.

The 1975 program was directed toward propagation, laser-target effects, aerosol interactions, and other related experiments. Concurrent with the development of the NACL by TRW, Hughes Aircraft was under contract to the Navy to develop a Navy Pointer Tracker (NPT) that would facilitate slewing of the laser beam to track fast moving targets.

When these two sophisticated systems were integrated into a single system, NACL/NPT, the Navy High Energy Laser Project Office (PMS 405) embarked on the Navy Unified Field Test Program (UNFTP) that had the following major goals:

1. Evaluation of aimpoint maintenance techniques in the presence of a high power 3.8 micron wavelength infrared laser beam.

2. Validation of computer models for various systems performance by comparison with measurements.

3. Verification of time-to-destruct estimates for flying targets based on lethality models.

4. Characterization of the NACL-NPT interface and the overall NPT performance.

Since the fulfillment of the stated objectives would require as part of the critical information needs, meteorological and beam diagnostic data similar to that provided by BRL in the 1974 and 1975 tests, it was logical that the Navy solicited the BRL expertise. Other BRL participation in UNFTP involved performing vulnerability assessments of the flying targets, design and conduction of a lethality demonstration experiment and on-site Army representation for the Project Manager for the Army High Energy Systems Project Office.

This report presents the compilation of the meteorological data obtained during the UNFTP.

¹Unified Naval Field Test Program, Aimpoint Maintenance Group Test Plan, 15 Sep 1976, pages 1-7.

I. INTRODUCTION

A. Background

An important part of the UNFTP Aimpoint 12 intenance program was the comparison of laser beam characteristic predictions with the actual measured performance of the NACL/NPT. In order to make such comparisons, it was necessary to measure several meteorological parameters at the test site. Previously, the Army had provided meteorogical support at the Capistrano Test Site during the 1974 BDL Phase II Experimental Program and the 1975 Joint Army-Navy (JAN) Propagation Program.

the greagation path.

The Navy had originally planned to perform the meteorological support for the UNFTP Aimpoint Maintenance Program, with the Army cooperating by furnishing equipment and consulting services. Subsequently, the Army was asked to assume complete responsibility for the total meteorological support program. This request was agreed to by the Army. It should be noted that elements of the Navy participated in this program and provided a significant portion of the equipment for measuring, recording, and analyzing the meteorological data.

B. Objectives

The primary objective of this meteorological measurement program was to provide the Field Test Manager with "quick look data" for specified parameters covering the period of time coinciding with the test period. By quick look, we mean that the test conductor desired to have specific information within minutes after the request or test. These data were recorded on digital magnetic tape recorders for quick reduction and presentation. They were also recorded on strip charts as a back up and for direct reading during test periods. The parameters requested for quick look changed frequently depending on the particular on-going program.

Another important objective of this program was to compile a climatological history of the immediate test site area. This was performed on a continuous basis from several locations. Not all parameters were measured at all times because of other priorities, sensor failure, inaccessibility of some sites due to prolonged rain, and limited personnel.

Equipment and personnel for this program were supplied by the Army Atmospheric Sciences Laboratories and by the Naval Surface Weapons Center, White Oak.

C. Theory

As a laser beam is propagated through the near earth atmosphere, a degradation of the beam's coherence, size, and direction occurs. These changes are caused by variations in the atmosphere's index of refraction which, in turn, are a result of the temperature variations in the 2near earth environment. The refractive index structure coefficient, C_n , is

a measure of the strength of the turbulent temperature fluctuations over the propagation path.

Further, as an infrared laser beam passes through the atmosphere it is attenuated by both scattering and absorption. The scattering occurs because of the presence of aerosols (particles of matter in the atmosphere). Molecular absorption occurs in relatively narrow absorption bands and is due to molecular transitions from one state of rotation-vibration to another, thereby absorbing or emitting a photon. The extinction coefficient, K, is the sum of the molecular absorption coefficient, α , and the scattering coefficient, β ,

$$K(\lambda) = \alpha(\lambda) + \beta(\lambda) \tag{1}$$

where λ is the wavelength of the laser beam.

The molecular absorption coefficient is calculated from an empirical relationship that has been verified by a host of experimenters. Some of these calculations are based on the partial pressure of H₂O only, while others use both the partial pressure of H₂O and temperature. Typical of these calculations is:

$$\alpha(\lambda) = a + bP + cP^2 \tag{2}$$

where α (λ) is the empirical molecular absorption coefficient; a, b, and c are calculated coefficients that are tabulated for the laser lines and P is the partial pressure of H_2O in torr.

The scattering coefficient at 3.8µm is derived from an empirical relationship between visibility and scattering:

$$\beta_3.8 = ... 2R^{-1}$$

where R is the visibility in kilo ers determined by the integrating nephelometer.

In order to determine optimum propagation windows and calculate extinction and absorption coefficients, a set of meteorological parameters were measured and recorded, then used as inputs to computer codes which calculate and print out the desired information. These parameters included:

Strength of Optical Turbulence
Horizontal Wind Velocity Normal to the Propagation Path
Wind Speed and Direction at Fixed Locations
Vector Wind
Temperature
Dew Point
Barometric Pressure
Total Solar Flux
Net Solar Flux
Scattering Coefficient (Local Visual Distance).

As microscale temperature fluctuations, caused by atmospheric turbulence, are transported across the laser source propagation path by the wind, a scintillation pattern is generated. This pattern drifts in the same direction as the wind. The CA-9 Space Anemometer measures the velocity of the drift and computes the normal component of the wind velocity from it. This wind component is a space averaged measurement, that is, the average wind component in the space from the laser source to the CA-9 Anemometer is measured. Very low wind velocity measurements can be made since this system has no threshold limits. This type of system allows measurements to be made across propagation paths that are inaccessible to conventional anemometers, as is the case at the TRW Capistrano Test Site.

The CA-9 is not accurate when precipitation or fog are present, or when the scintillation saturates. Saturation will occur when the path length is long, the laser beam is only a few metres above the ground, and there is strong solar heating. A valid signal from the CA-9 was recorded to determine the quality of the normal wind component data. This signal indicates three data categories; valid, doubtful, and invalid.

The vertical crosswind measurements are made in the same manner, except for the orientation of the CA-9 anemometer.

The refractive index structure coefficient, C_n^2 , is a measure of the strength of the turbulent temperature fluctuations over the propagation path. This measurement was made by a CA-9 Space Averaging Anemometer that monitors the drifting scintillation pattern discussed above. The quantity being recorded from the CA-9 is the standard deviation of the log amplitude fluctuations, $\sigma_{\rm YC}$.

The relationship between C_n^2 and σ_χ is shown in Tatarski's Spherical Wave Equation 2 :

$$\sigma_{\chi}^{2} = 0.124 \frac{2\pi}{\lambda}^{7/6} L^{11/6} C_{n}^{2}$$
 (4)

where σ is as above, λ is the wavelength of the laser source, and L is the path length.

²V.I. Tatarski, <u>Wave Propagation in a Turbulent Medium</u>, Vol. 1, McGraw-Hill, 1961, page 211.

In equation (4) distance agolfoutoult courrequest electronic 2/

$$\sigma_{\chi} = 2\sigma_{\chi c}$$
 (5)

 $\sigma_{\chi} = 2\sigma_{\chi c}$ (5) where $\sigma_{\chi c}$ is the standard deviation as measured by the CA-9³. Combining equations (4) and (5), and rearranging: equations (4) and (5), and rearranging:

$$C_{n}^{2} = \frac{32.258^{\sigma} \chi c^{2}}{\frac{2\pi}{\lambda} 7/6} L^{11/6}$$
 (6)

The C_n^2 measurements by the CA-9 system are generally not as precise as measurements by fine wire thermal probes or angle of arrival systems, but they are integrated path measurements which are better suited to the data requirements than the discrete point measurements from the other techniques.

II. EXPERIMENTAL PROCEDURE

Site Locations

The terrain over which these measurements are made is characterized by deep ravines and hills, limiting sensor locations to the extreme ends of the propagation paths. Four measurement sites were selected for the collection of meteorological data. The principal sites were located at the Navy Pointer-Tracker where a tower was erected to accommodate an array of sensors and, at the 500 metre site where a similar tower with sensors was located. Two other sites were located at an area adjacent to the helicopter test pad and at the 1500 metre site. These latter two sites were used primarily as the termini for the laser crosswind sensor and strength of optical turbulence (C_n^2) measurements. Wind speed and direction were also measured at these sites as requested. The locations of these sites relative to the Navy Pointer-Tracker (NPT) are shown in figure 1. Sites 2 and 4 are approximately the distances indicated from the NPT.

Instrumentation

A variety of instrumentation was used to measure the various meteorological parameters. These instruments are discussed in the following paragraphs. is the path length.

G.R. Ochs, Evaluation of Campbell Scientific Model CA-9 Space Averaging Anemometer, 1 April 1974.

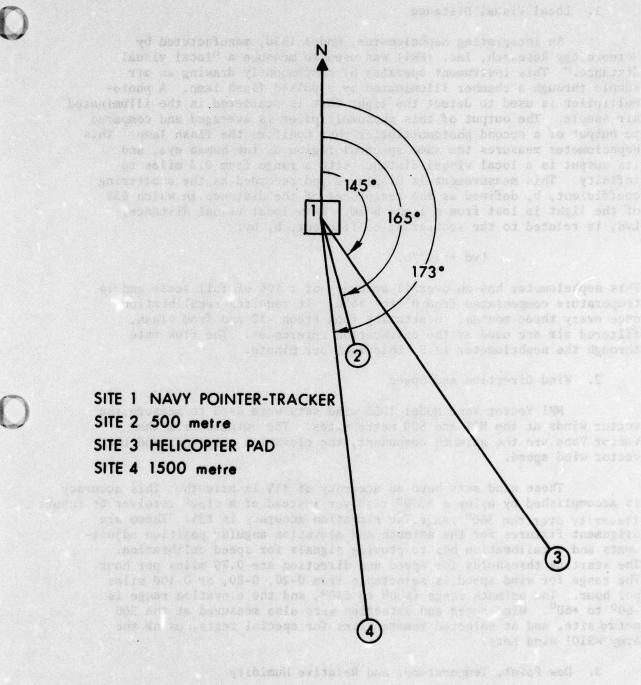


Figure 1. Meteorological Measurement Sites Relative to the Navy Pointer-Tracker

1. Local Visual Distance

An integrating Nephelometer, Model 1550, manufactured by Meteorology Research, Inc. (MRI) was used to measure a "local visual distance." This instrument operates by continuously drawing an air sample through a chamber illuminated by a pulsed flash lamp. A photomultiplier is used to detect the light that is scattered in the illuminated air sample. The output of this photomultiplier is averaged and compared to output of a second photomultiplier that monitors the flash lamp. This nephelometer measures the same spectral region as the human eye, and its output is a local visual distance with a range from 0.3 miles to infinity. This measurement is displayed and recorded as the scattering coefficient, b, defined as the reciprocal of the distance in which 63% of the light is lost from a light beam. This local visual distance, Lvd, is related to the scattering coefficient, b, by:

Lvd = 4.7/b.

This nephelometer has an overall accuracy of \pm 10% of full scale and is temperature compensated from 0° to 54°C. It requires recalibration once every three months. Scattering from Freon -12 and from clean, filtered air are used as the calibration references. The flow rate through the nephelometer is 5 cubic feet per minute.

2. Wind Direction and Speed

MRI Vector Vane Model 1053 wind sets were used to measure the vector winds at the NPT and 500 metre sites. The outputs from the Vector Vane are the azimuth component, the elevation component and the vector wind speed.

These wind sets have an accuracy of $\pm 1\%$ in azimuth. This accuracy is accomplished by using a $\pm 270^{\circ}$ resolver instead of a $\pm 150^{\circ}$ resolver to insure linearity over the 360° range. The elevation accuracy is $\pm 2\%$. There are alignment fixtures for the azimuth and elevation angular position adjustments and a calibration box to provide signals for speed calibration. The starting thresholds for speed and direction are 0.75 miles per hour. The range for wind speed is selectable from 0-20, 0-80, or 0-100 miles per hour. The azimuth range is 0° to 540° , and the elevation range is -60° to $+60^{\circ}$. Wind speed and direction were also measured at the 500 metre site, and at selected remote sites for special tests, using the Army WS101 wind sets.

3. Dew Point, Temperature, and Relative Humidity

The dew point, ambient temperature, and relative humidity were measured by an EG&G Corporation Relative Humidity analyzer. This system is aspirated and housed in a wind and solar shielded environment. The range for both the dew point and ambient temperature is -40° C to $+50^{\circ}$ C with an accuracy of $\pm1^{\circ}$ C. The dew point response is 2° per second

maximum, and the dew point depression is 27°C. Response of the ambient temperature has a 60 second time constant.

4. Barometric Pressure

Barometric pressure was measured with a MRI Model 751 Barometric Pressure sensor that has a range of 71.1 to 81.3 cm of mercury. The linearity is $\pm 0.3\%$, sensitivity of 0.2%, and a hysteresis and repeatability within 0.2%. The operating temperature range is -34° C to $+82^{\circ}$ C. Calibration is accomplished by a 10 point calibration of pressure versus resistance ratio output.

5. Refractive Index Structure Coefficient

Measurements of the normal crosswind velocity and the refractive index structure coefficient $({\color{blue}C_n^2})$ were made with a Campbell Scientific Model CA-9 Space Averaging Anemometer. The theory of operation of the CA-9 was discussed in Section I-C. The normal component of the wind velocity and the refractive index structure coefficient measurements were made primarily between the NPT and the 500 metre site; although some measurements were made between the NPT and the helicopter pad, and between NPT and the 1500 metre site.

6. Solar Flux

Both net and total solar flux were measured at the 500 metre site, and total solar flux was measured at the NPT. The units of solar flux are langleys per hour. The total solar flux is measured with a pyroheliometer that has a field of view of 2π steradians. The net radiometer measures the amount of surface heating that is associated with the total solar radiation.

Calibration of these instruments is normally performed on an annual basis at the factory. Cleaning of the glass dome of this hermetically sealed unit is the only required maintenance.

7. Soil Temperature and Ambient Temperature

Soil temperature and ambient temperature near the earth surface measurements were made at the request of the test director. The sensors were constructed on site, and there was no calibration or response information to accompany the data collection.

These measurements were made at the 500 metre site using thermocouples. The soil thermocouple was placed approximately one inch deep into the soil. The ambient thermocouple was shielded from solar flux by a stainless steel plate, but the thermocouple was not aspirated. Due to the lack of calibration and response characteristics, the data are omitted from this collection of climatological data.

C. Data Recording and Processing

The meteorological data were digitally recorded on a Datel Data Logger Model DL2 located close to the sensors. The magnetic tape cassettes from the Datel system were taken to a computer facility and consolidated onto nine track magnetic tapes. Table I presents the channel assignments on the tape, and the site where the data were collected.

All meteorological data were processed as follows:

Each datum point was checked for the range shown in Table II. Those points that were out of range were discarded and a count of their number recorded.

For most channels a validity check was also made, as shown in Table II. The discard of data that did not meet this check eliminated problems caused by instrument malfunction.

For channels 8, 9, 10, 17, 29, 30, 32, and 33, data points that were identical with the previous point were also discarded.

Data were averaged over a five minute period, resulting in 300 data points assuming that no data were discarded.

An average result for a five minute sampling period would be obtained from 300 data points assuming no data were discarded.

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site, and total solar flux was measured at the NFT. The mosts of solar

A. General Total and and and appropriate to remove out concerns testanother

The Capistrano Test Site presents a very hostile environment for a meteorological measurement program. Electric power lines have frequent voltage surges that raise havor with sensors and with small, low power lasers that are used for crosswind and strength of optical turbulence measurements. The rodent population tended to consume data lines and power lines, and the long periods of sustained rain made the maintenance and collection of data at the remote sites a formidable task.

In addition to the above mentioned problems, the terrain itself makes the characterization of the test site a difficult task. There are deep ravines and high hill tops which have a pronounced effect on wind fields, and there can be wide temperature fluctuations.

Appendices A through J contain 24 hour plots of the data, grouped by related meteorological parameters. For example, Appendix A contains 24 hour plots of the vector wind speed, azimuth, and elevation recorded at the NPT site. The value being plotted is shown on the ordinate axis with the units for that parameter. Time on a 24 hour basis is shown on

Table 1. Magnetic Type Channel Assignments

Parameter	Channe1	Site
Vector Wind Speed	5	NPT
Vector Wind Azimuth	6 KVW 8	8 NPT
Vector Wind Elevation	7	NPT
Dew Point	(mmin sporgab 0	NPT
Temperature Short Holds	vote ere greb 0/+	OF NPT
Barometric Pressure	10	on NPT
Horizontal Crosswind	11	NPT-500m
Vertical Crosswind	14	NPT-500m
Optical Turbulence (C _n ²)	12 10 518	NPT-500m
Scattering Coefficient	17, Nat. 0.19	NPT ES
Horizontal Crosswind	18	NPT-1500m
Optical Turbulence (C _n ²)	19	NPT-1500m
Total Solar Radiation	22	NPT
Horizontal Crosswind	23	NPT-HELIPAD
Optical Turbulence (C _n ²)	24	NPT-HELIPAD
Vector Wind Speed	26	500m
Vector Wind Azimuth	27	500m
Vector Wind Elevation	28	500m
Dew Point	29	500m
Temperature	30	500m
Soil Temperature	7/148Yet 33 876	500m
Ambient Temperature	32	500m
Wind Speed	1891 35 51160	500m
Wind Direction	34	500m
Net Solar Radiation	31	500m
Total Solar Radiation	36	500m

Table II. Data Filters for Meteorological Data

Channels	Range	Validity Check
5,26	0 to 8.9 m/s	none Plantia balw to 1997
	TW	Tweeter Wind Elevation
6,27,34	0 to 540 degrees azimuth	none gard watt
7,28	-60 to +60 degrees elevation	none statement
8,29	-17 to +30°C	change <0.5 per step
9,30	-17 to +50°C	change <1.0 per step
10	715 to 812 mm Hg	change <0.4 per step
11,18,23	-10 to +10 m/s	change <1.0 per step
12,19,24*	0 to 1.0* dimensionless	change in log ₁₀ <0.8 per step
14	-5 to +5 m/s	change <0.4 per step
17 0401.731	0 to 10 km ⁻¹	change <1.0 per step
22 GASLASI	0 to 167 langleys/hr	change <0.25 per step
32,33	-40 to +60° C	change <2.0 per step
35	0 to 26.8°C m/s	none solding of ball tester
36	0 to 224 langleys/hr	change <10 per step
31	-378 to +378 langleys/hr	change <10 per step

^{*}Range is for raw data, validity test was applied after C_{n}^{2} was calculated.

the abscissa. Julian days and measurement sites are indicated in the upper right hand corner of each plot. When two sites are specified, the measurement was an integrated path measurement between the two sites.

IV. SUMMARY

The meteorological measurement program was a successful program because of its ability to supply timely quick look data to the Field Test Manager as he needed it, and simultaneously provide a compilation of the climatological history of the area. These two objectives were met in spite of many sensor failures, equipment break downs, and other difficult obstacles. The meteorological instrumentation required constant attention which caused long hours of work for the limited staff.

Because of the importance of the meteorological data to the decisions that were to be made each day by the Field Test Manager and by the contractors who operated the NACL and the NPT, it was essential to the program to have reliable data when it was required. In order to supply this data, frequent calibration of sensors and validity checks were made.

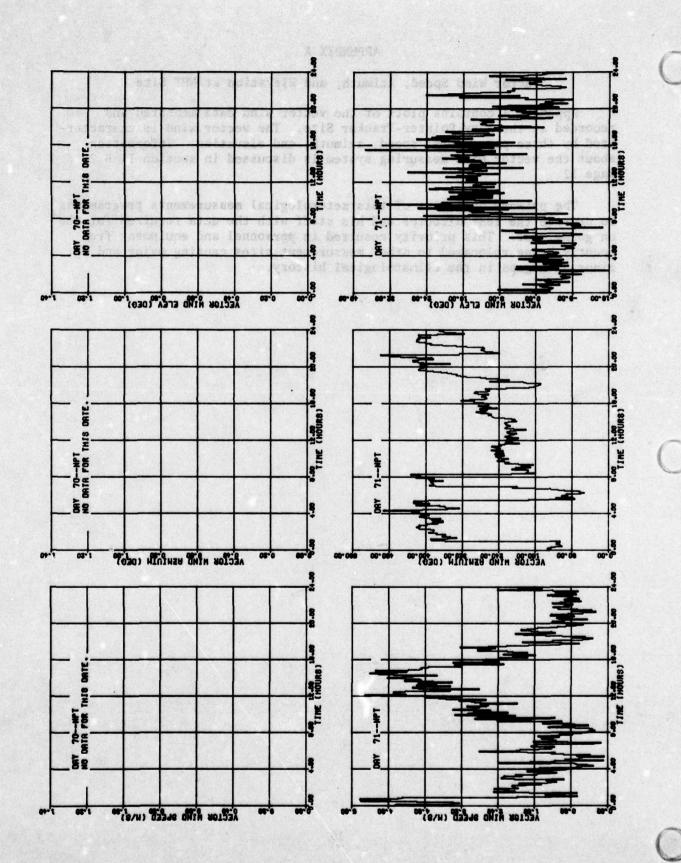
During the entire meteorological measurement program, all requests for specific data from the Field Test Manager were supplied in a timely manner. When problems precluded the data from a specific sensor or parameter, the information was obtained from a redundant system or from another location on the test site.

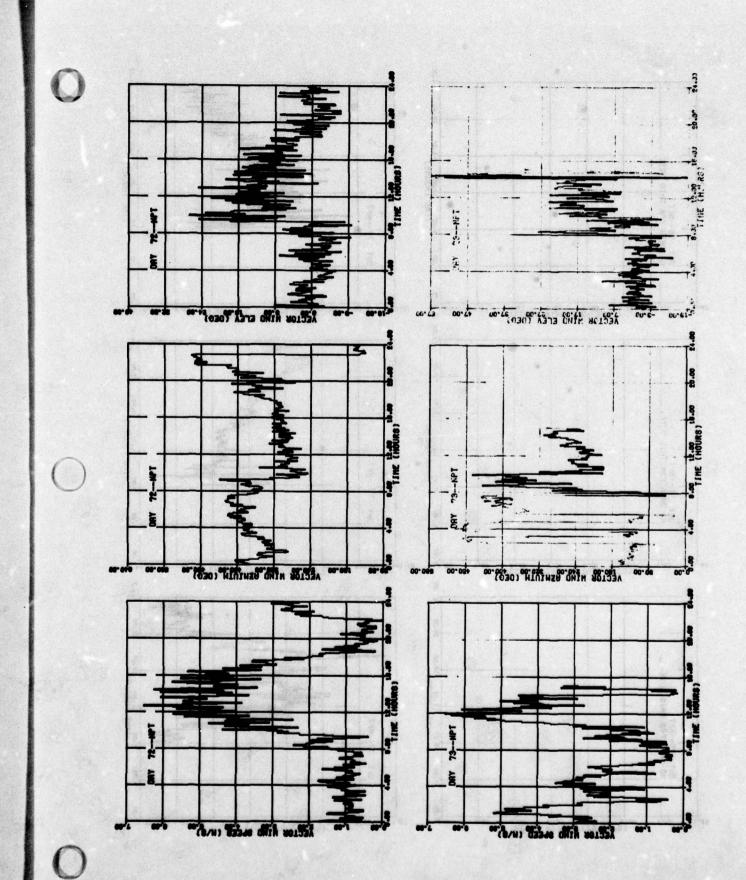
APPENDIX A

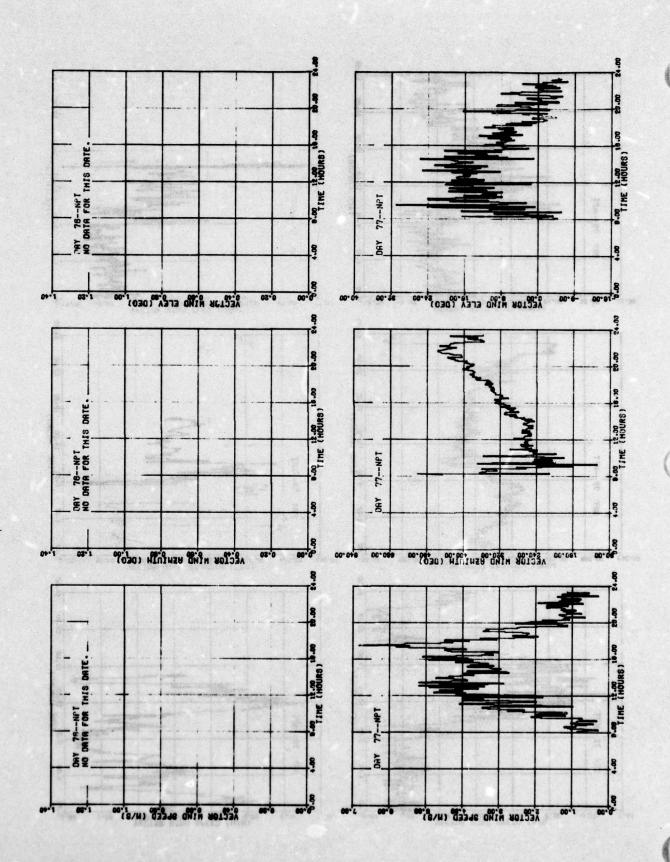
Vector Wind Speed, Azimuth; and Elevation at NPT Site

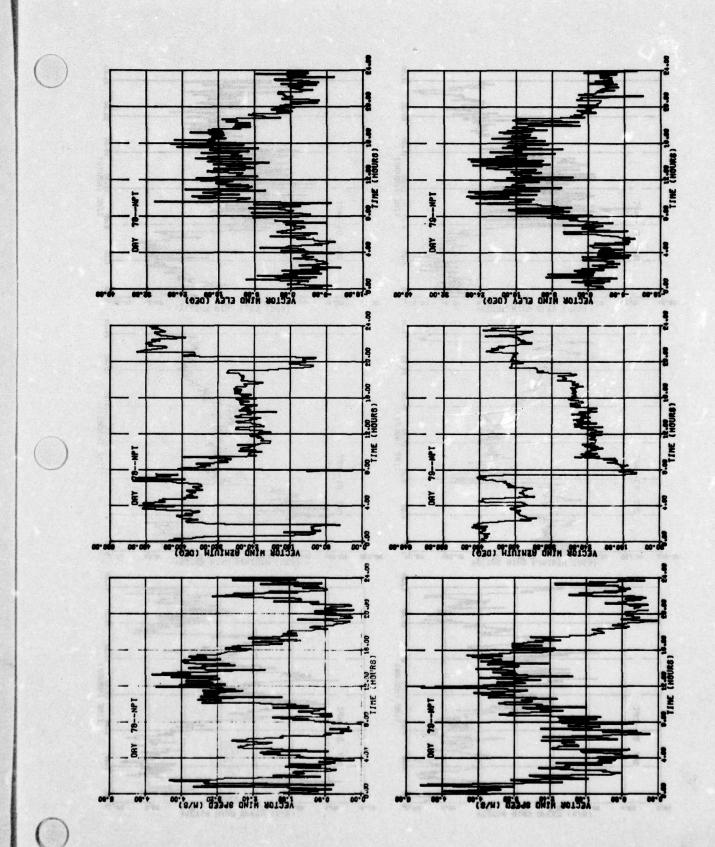
Appendix A contains plots of the vector wind data measured and recorded at the Navy Pointer-Tracker Site. The vector wind is characterized by three parameters; speed, azimuth, and elevation. Information about the vector wind measuring system is discussed in section II B 2, page 12.

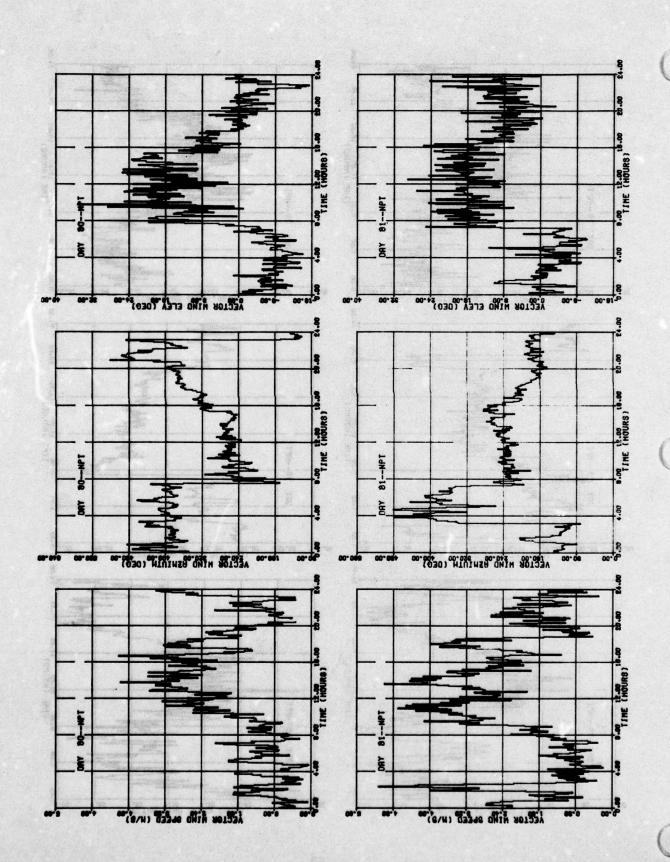
The primary objective of this meterological measurements program was to provide the test director and his staff with the data required for the on going test. This priority resulted in personnel and equipment frequently being relocated to other measurement sites causing major and minor data gaps in the climatological history.

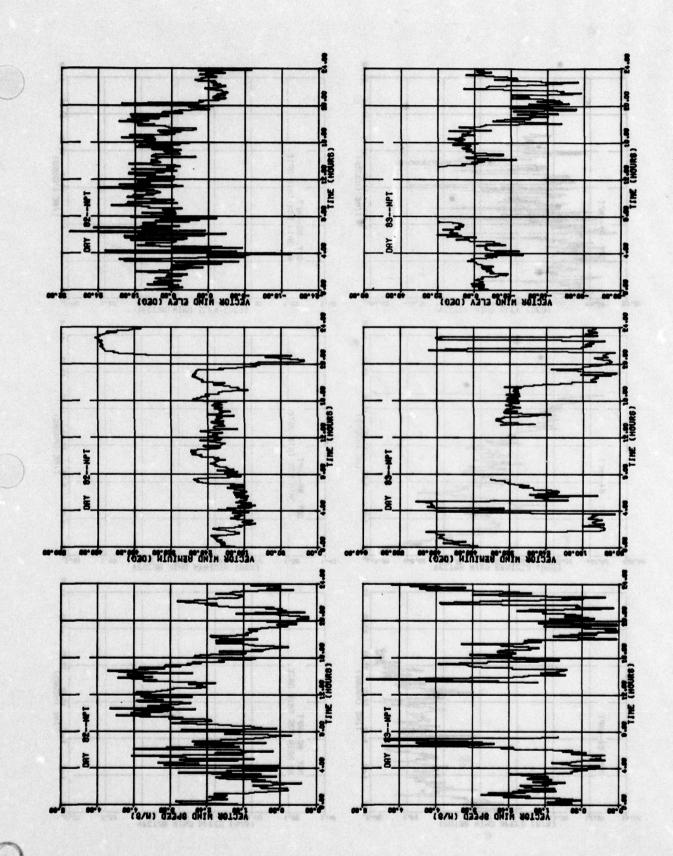


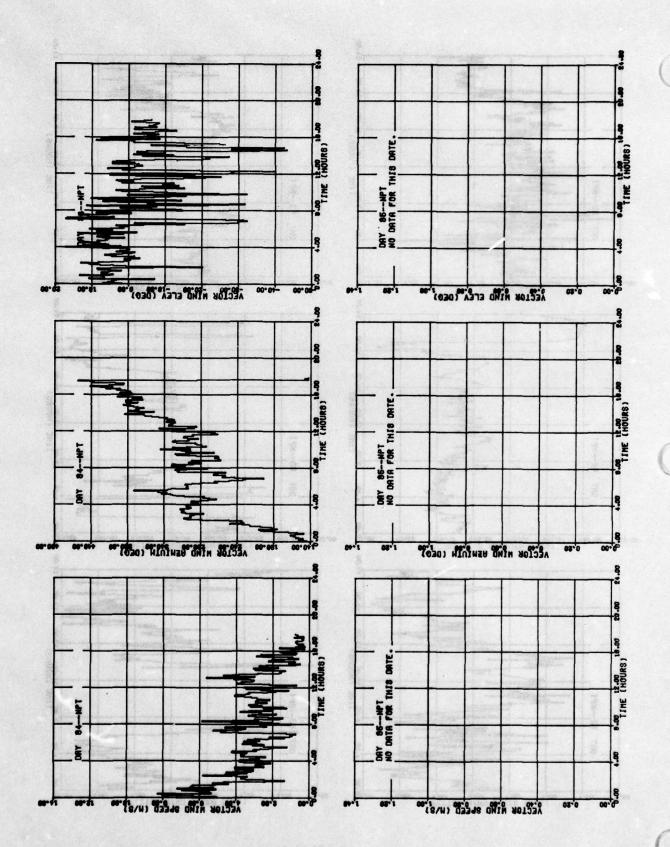


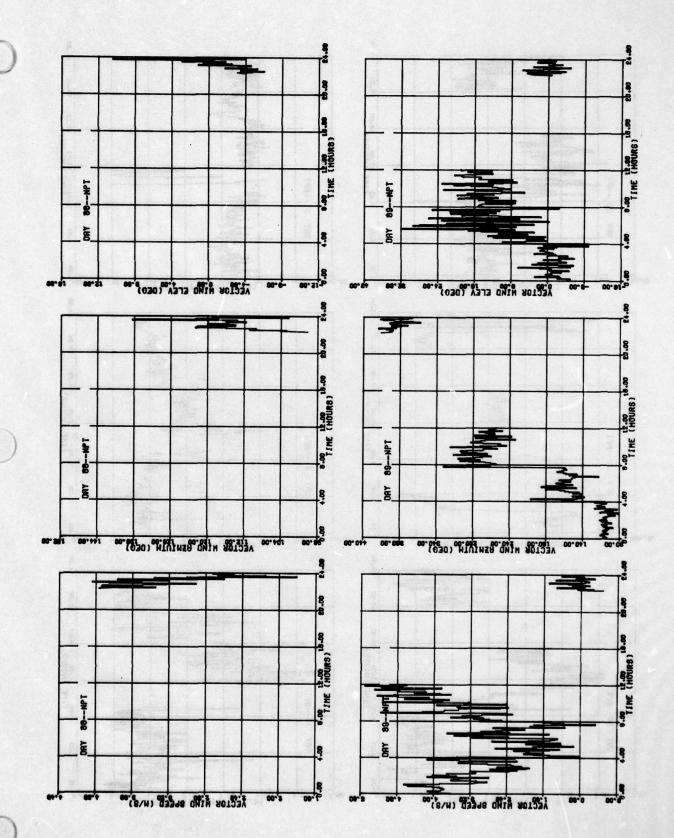


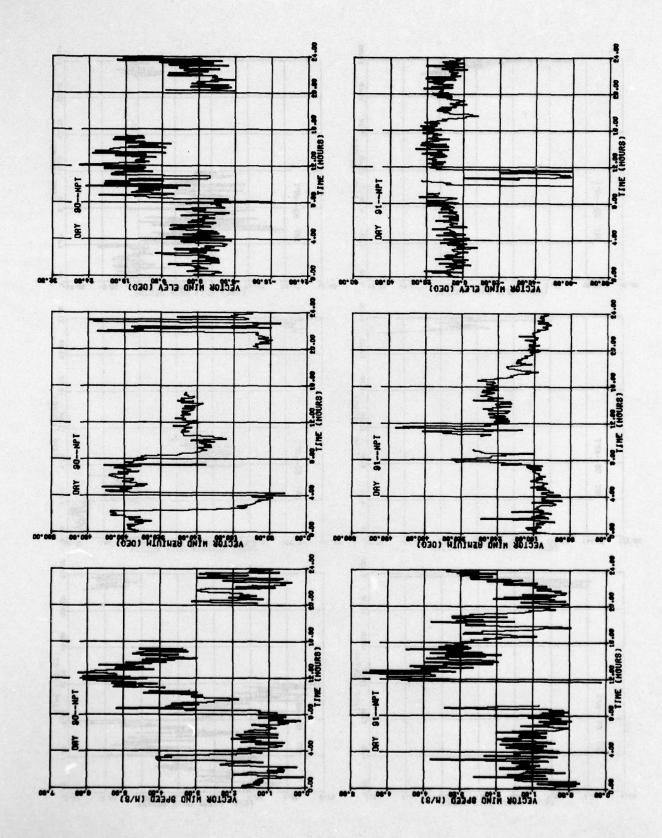


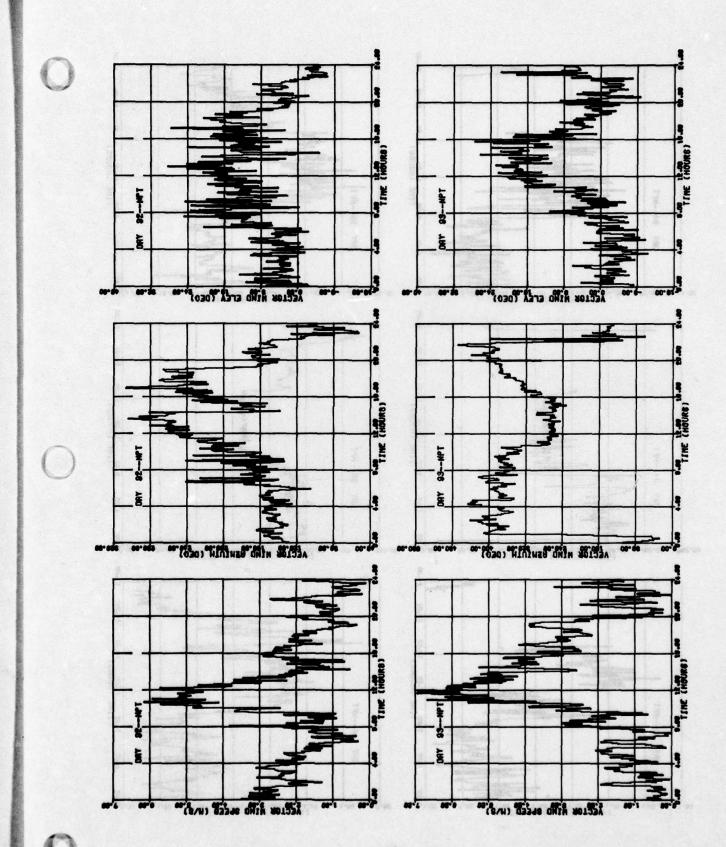


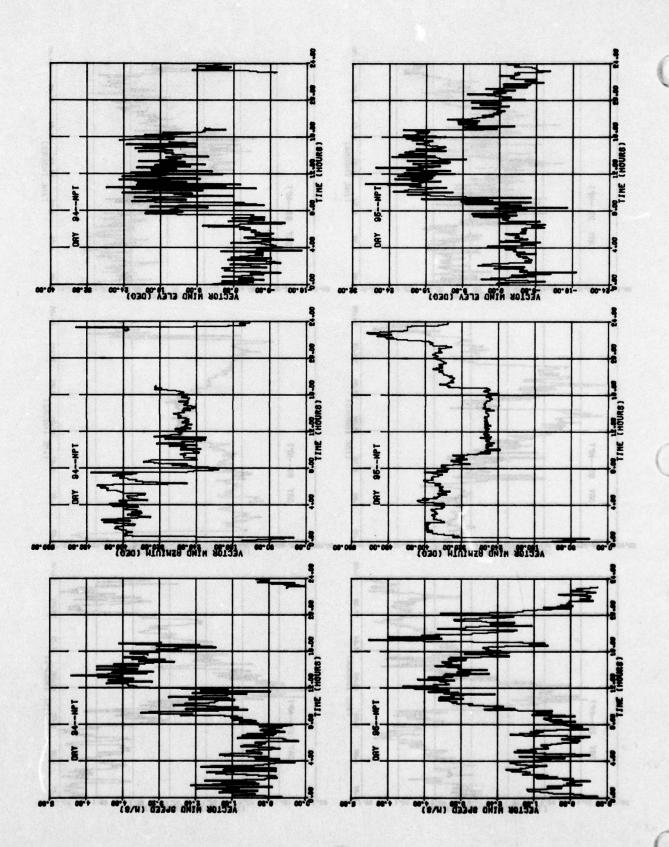


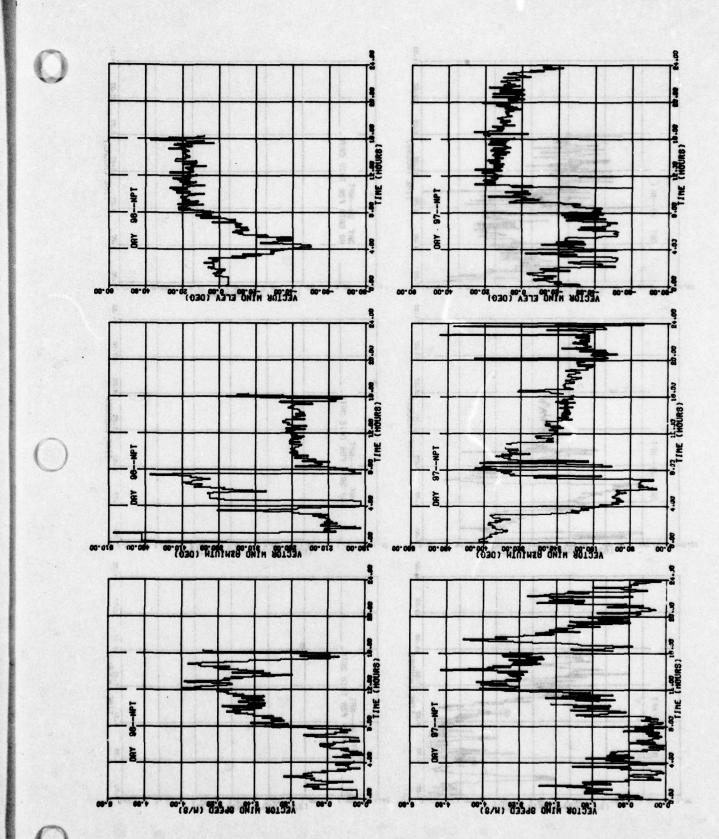


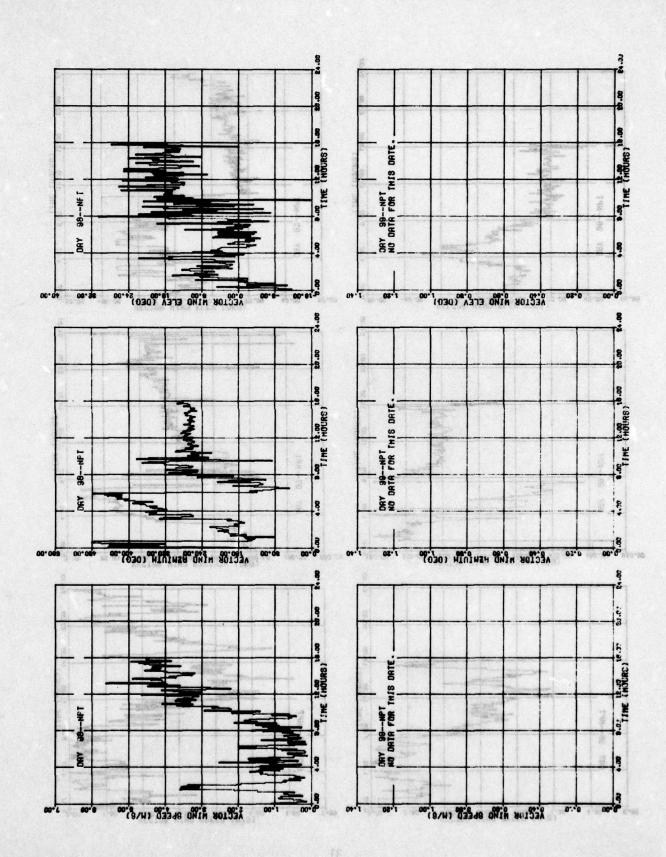


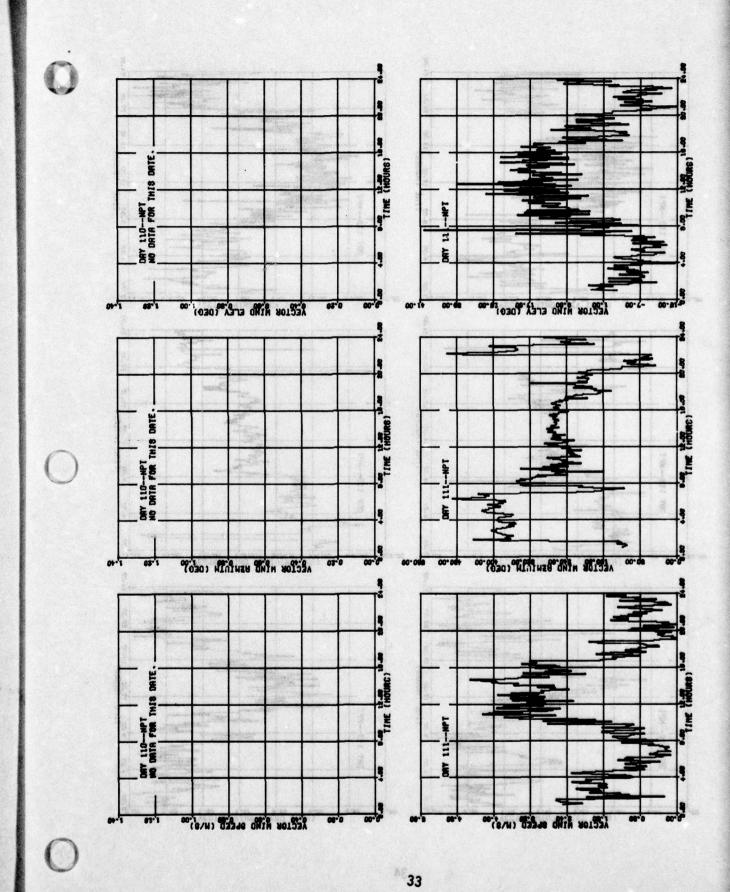


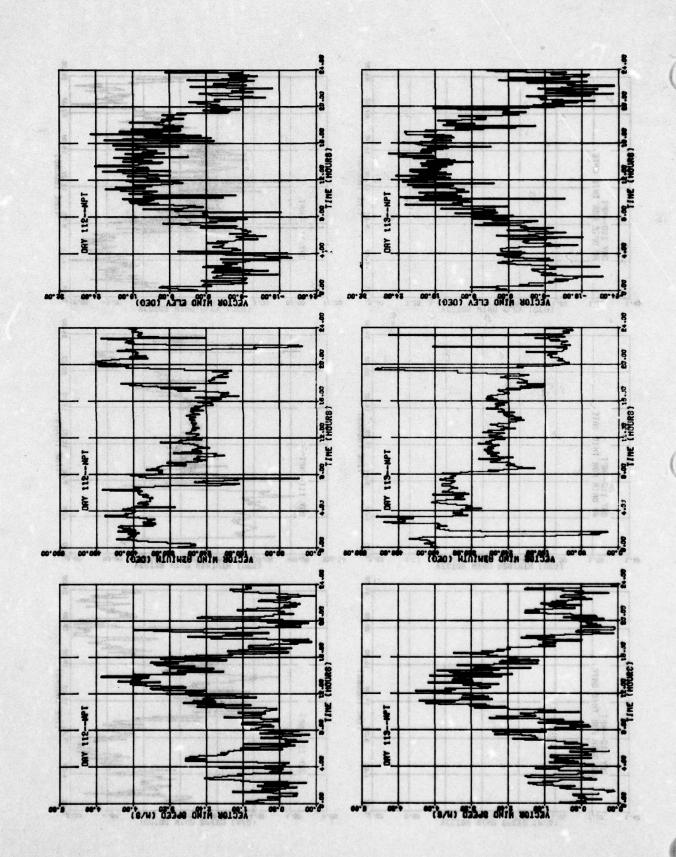


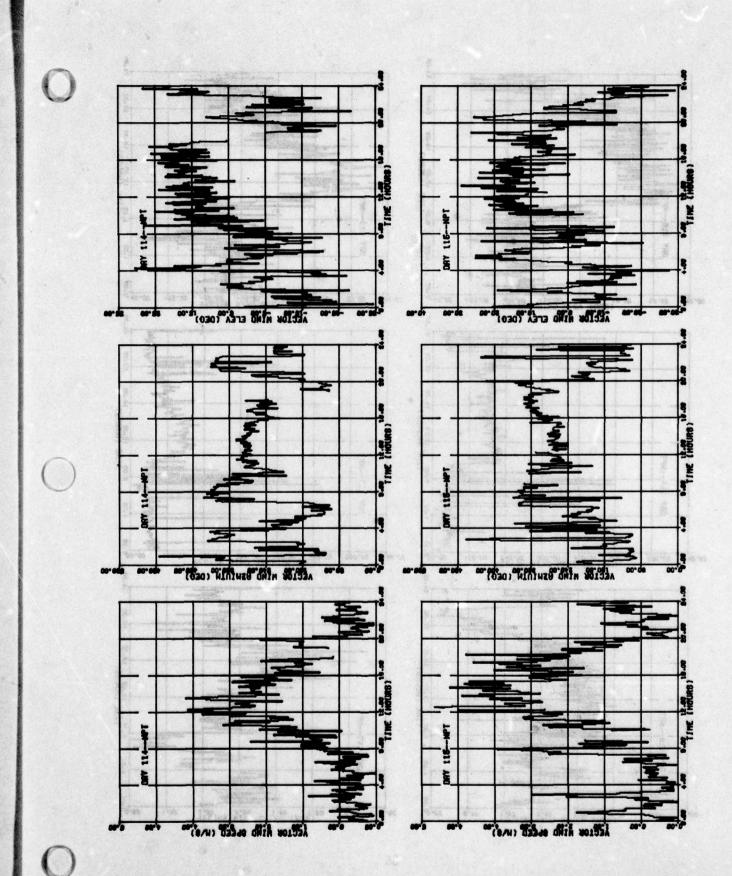


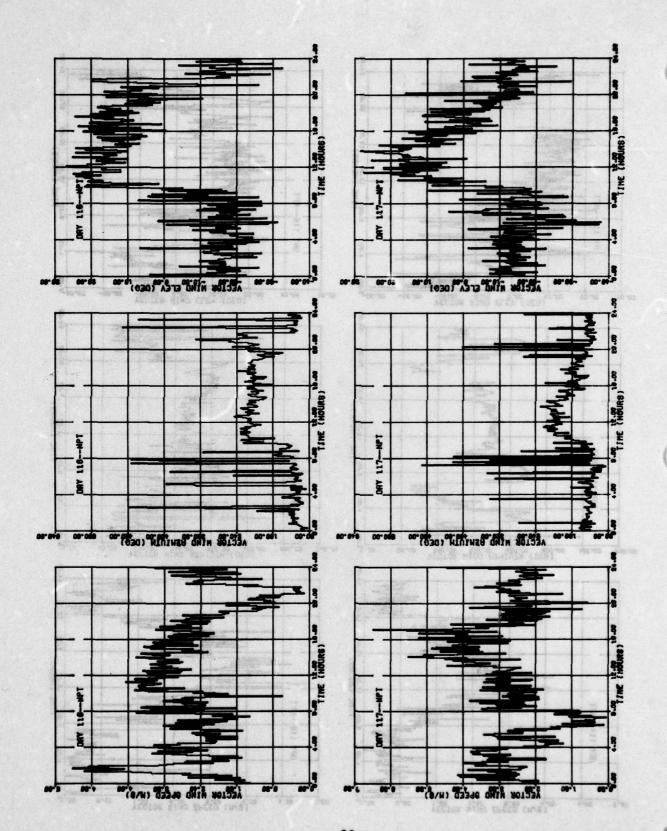


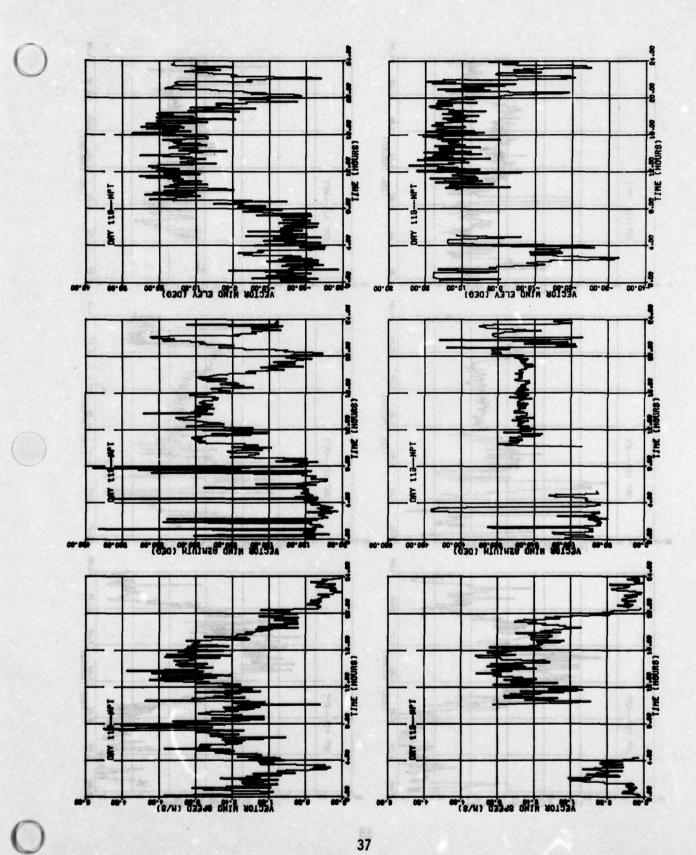


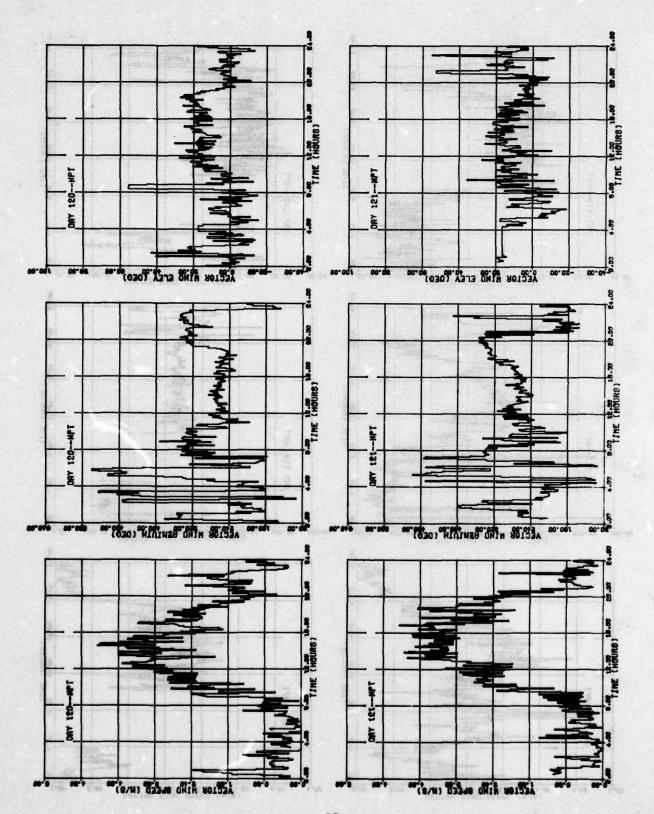


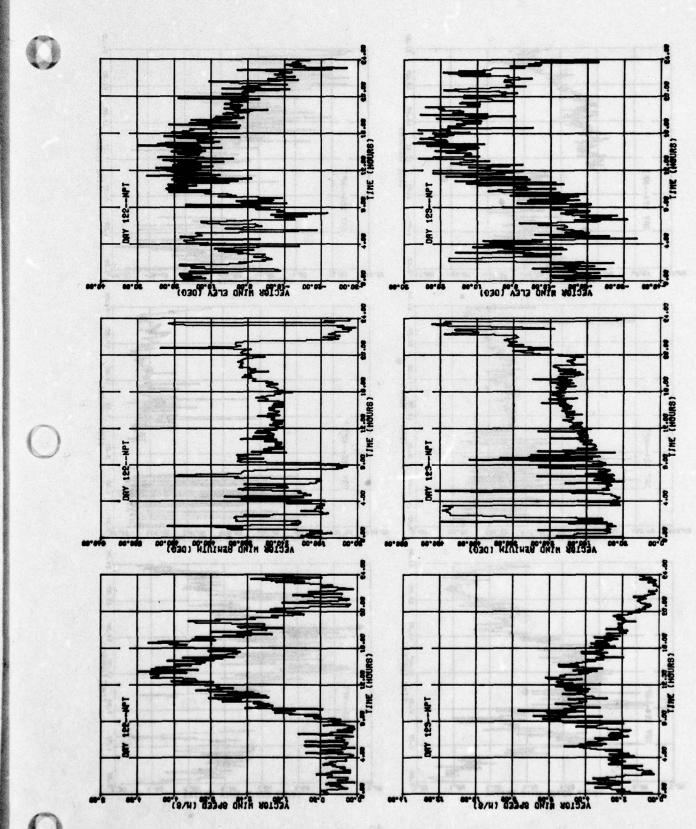


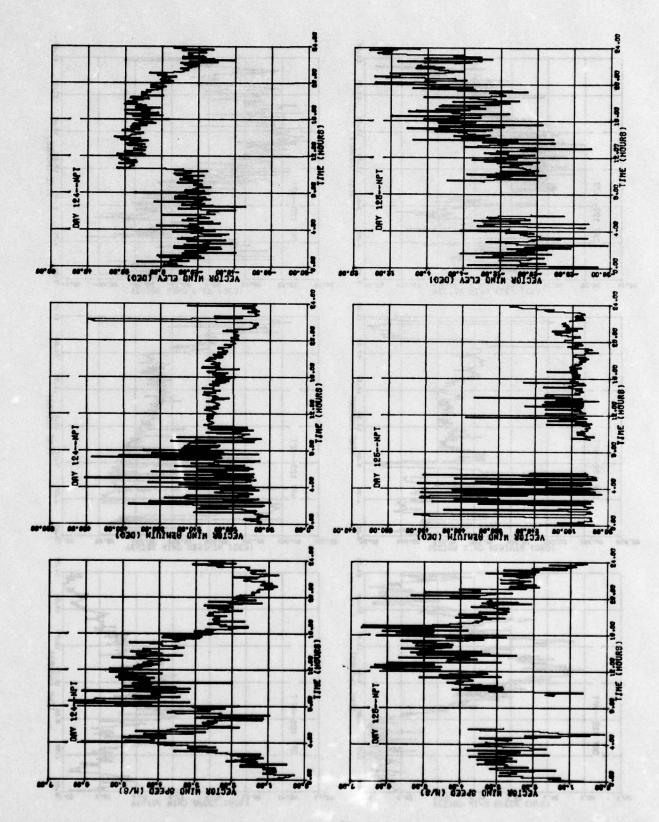


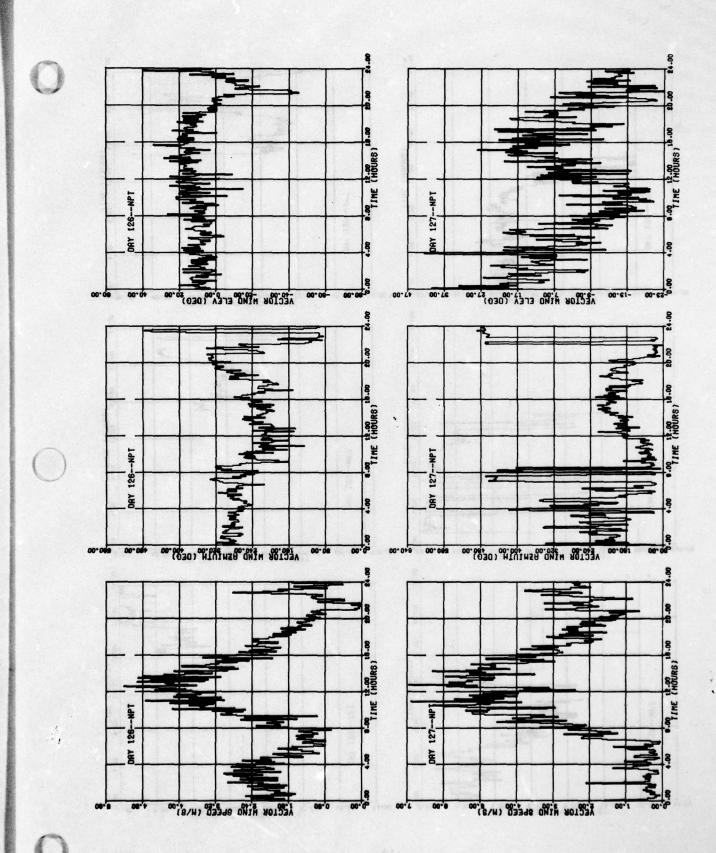


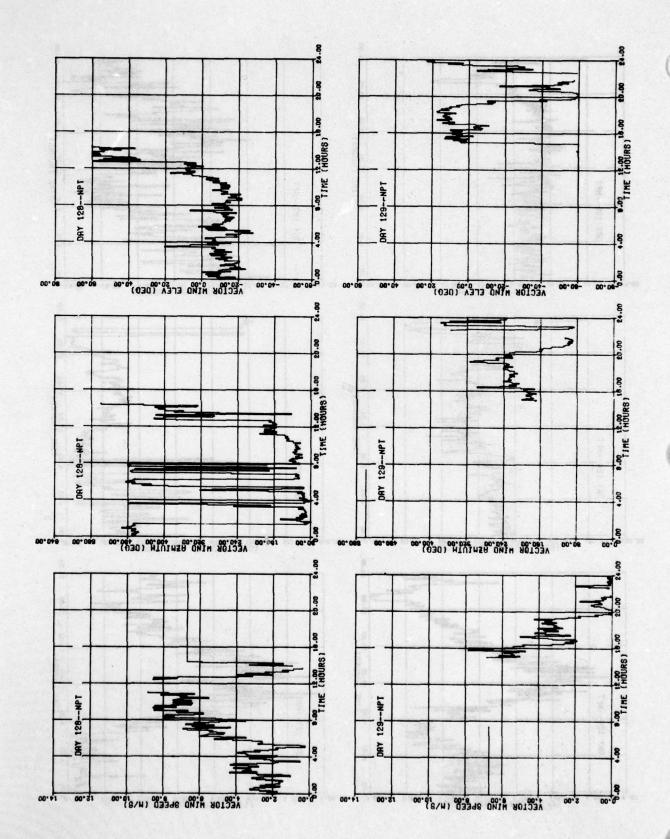


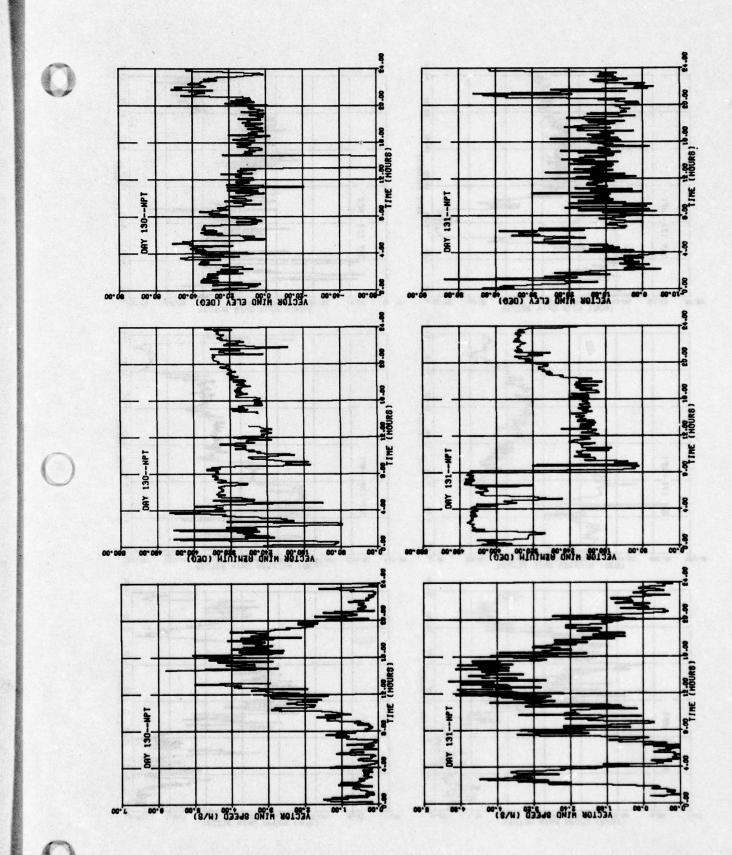


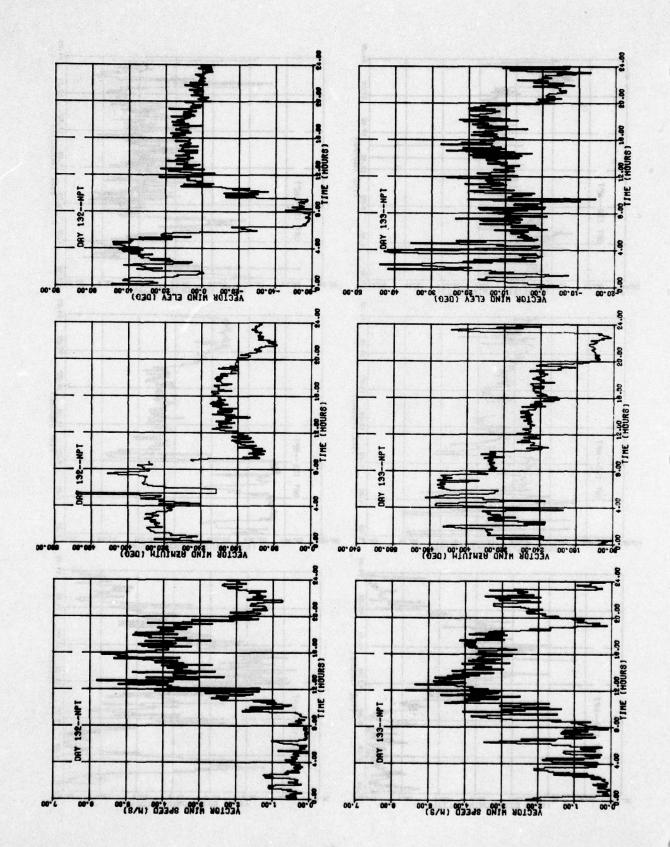


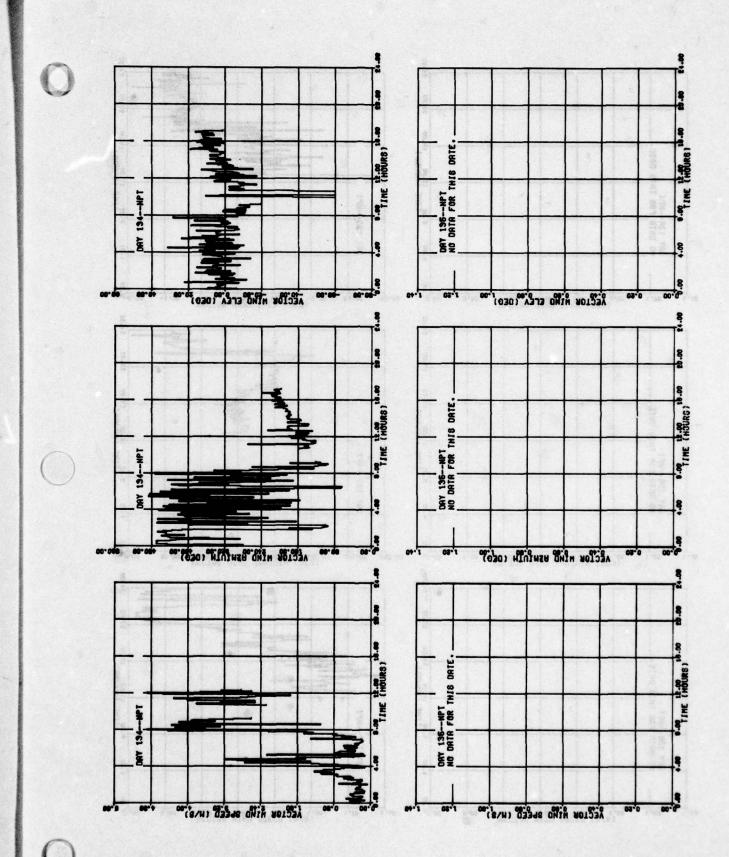


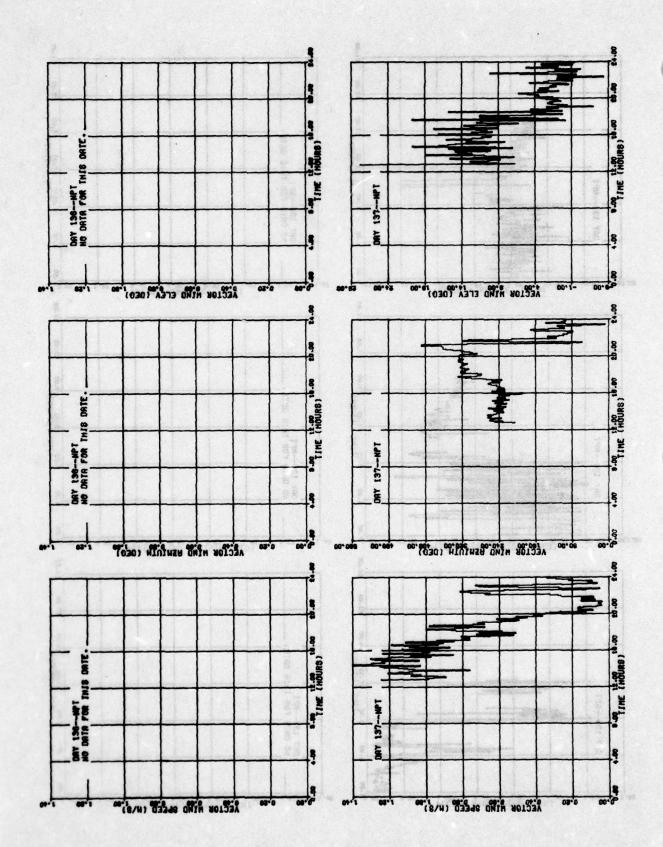


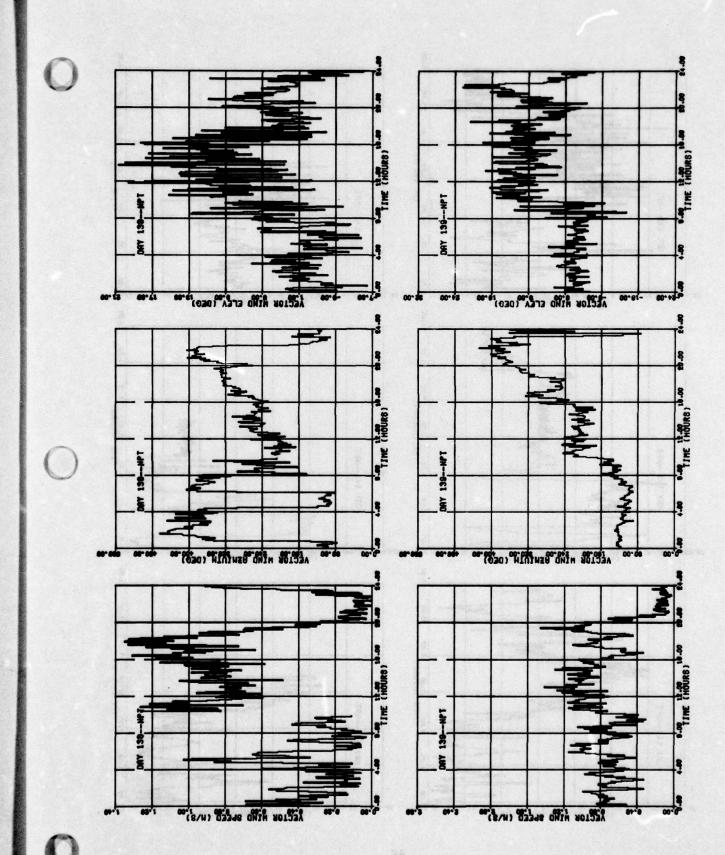


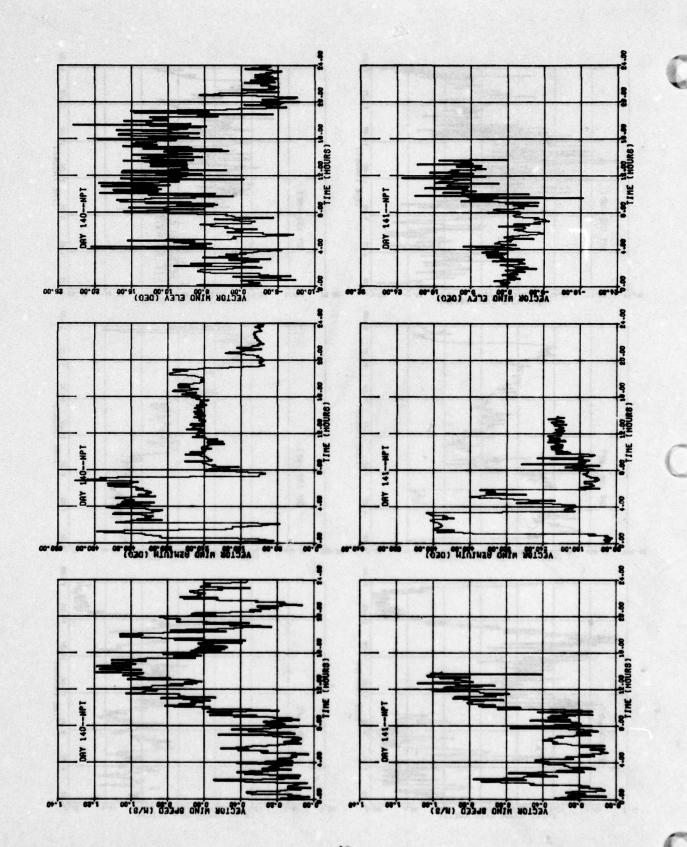


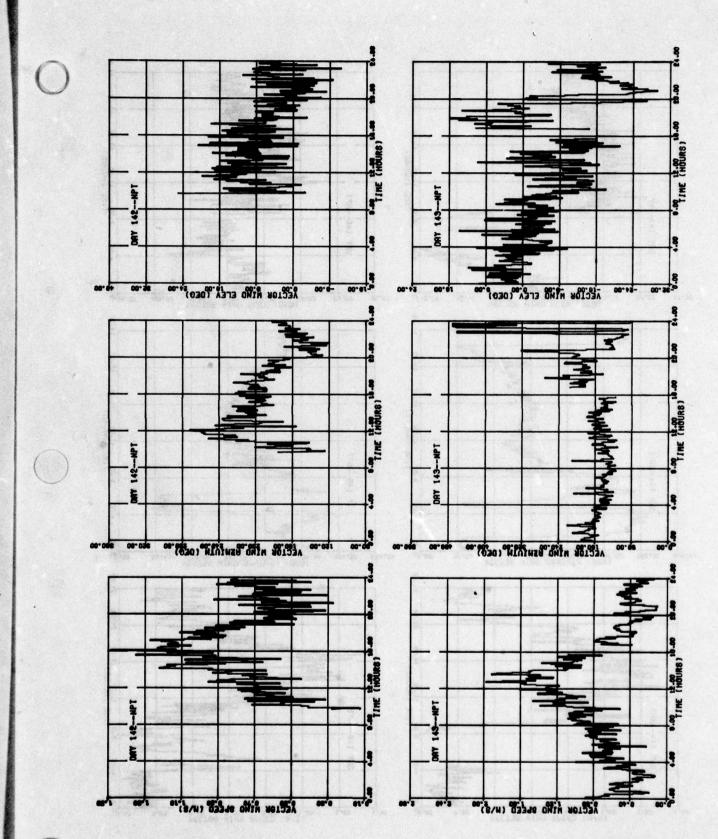


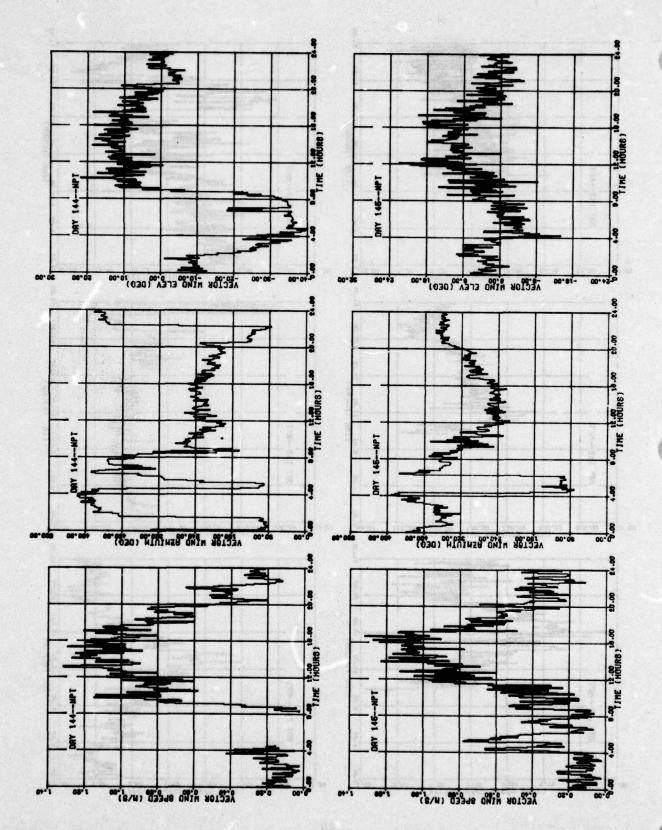


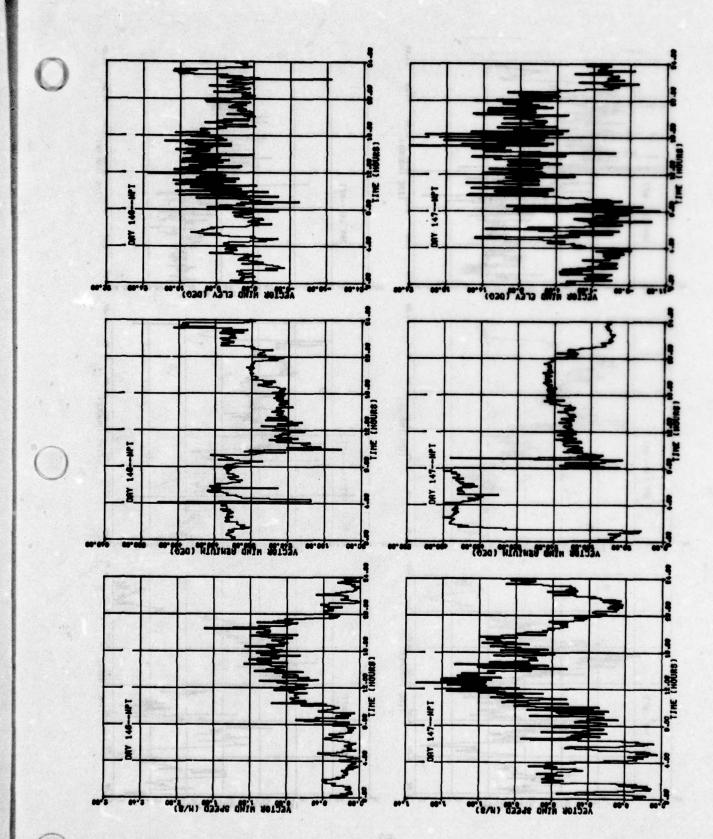


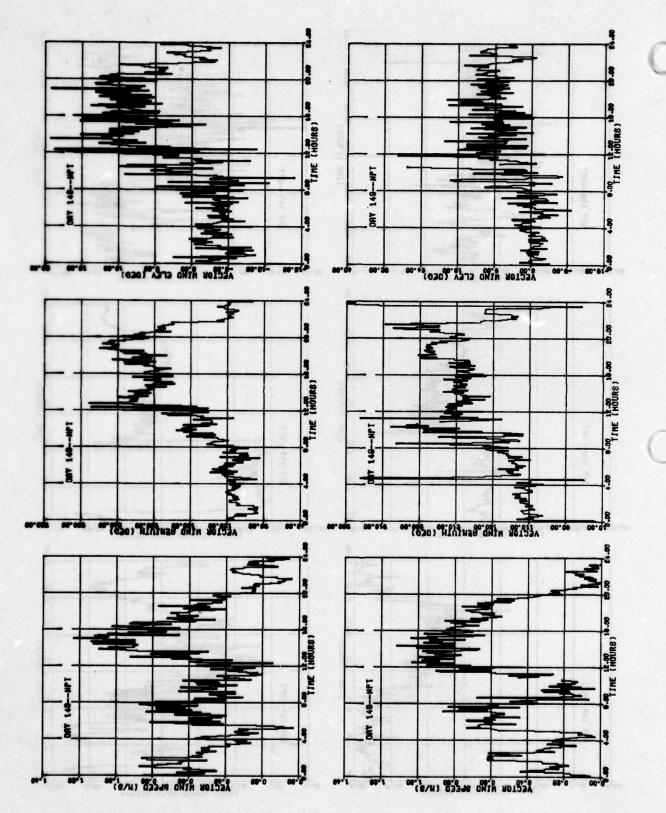


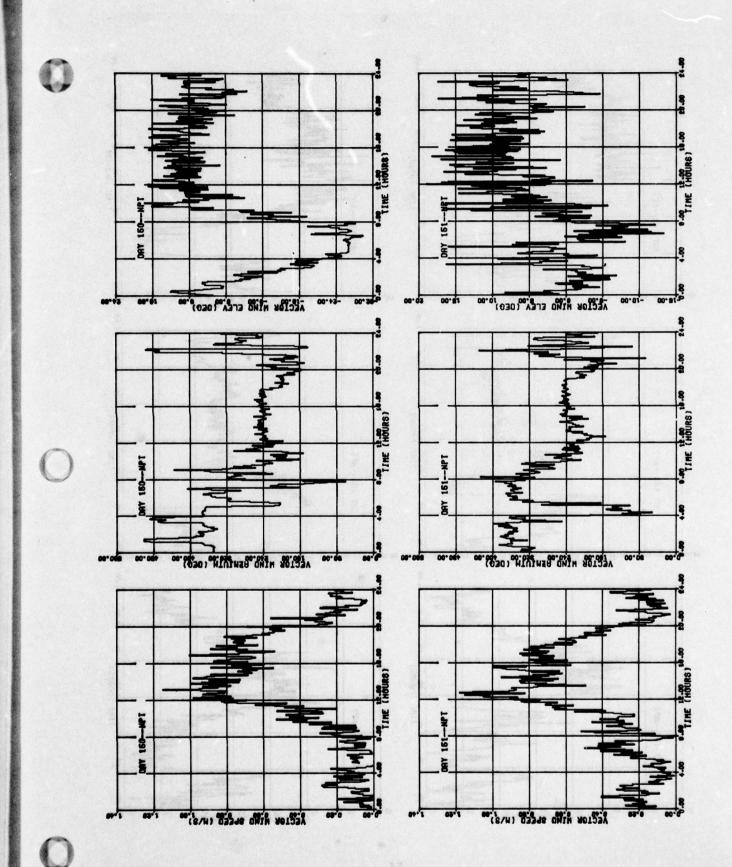


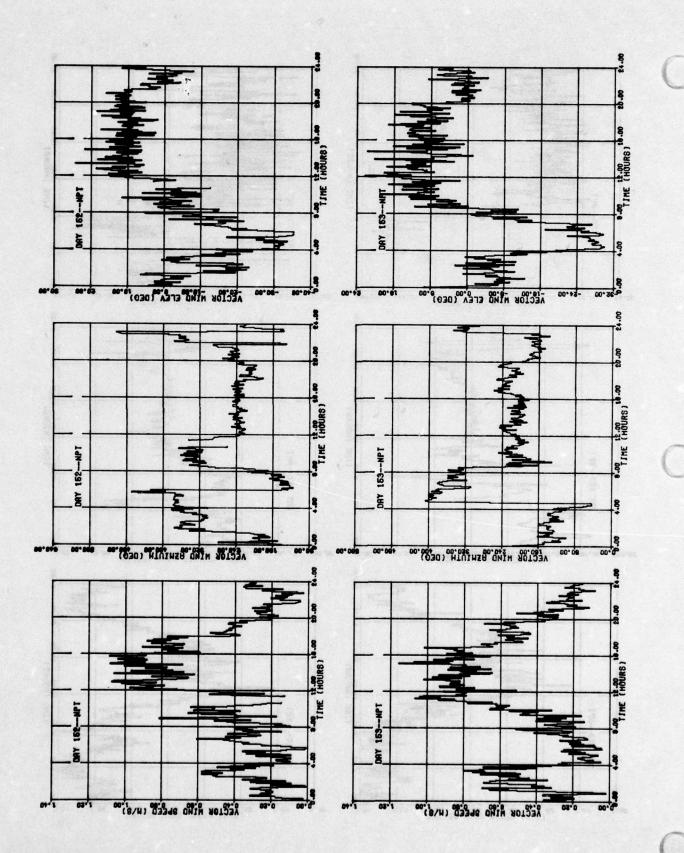


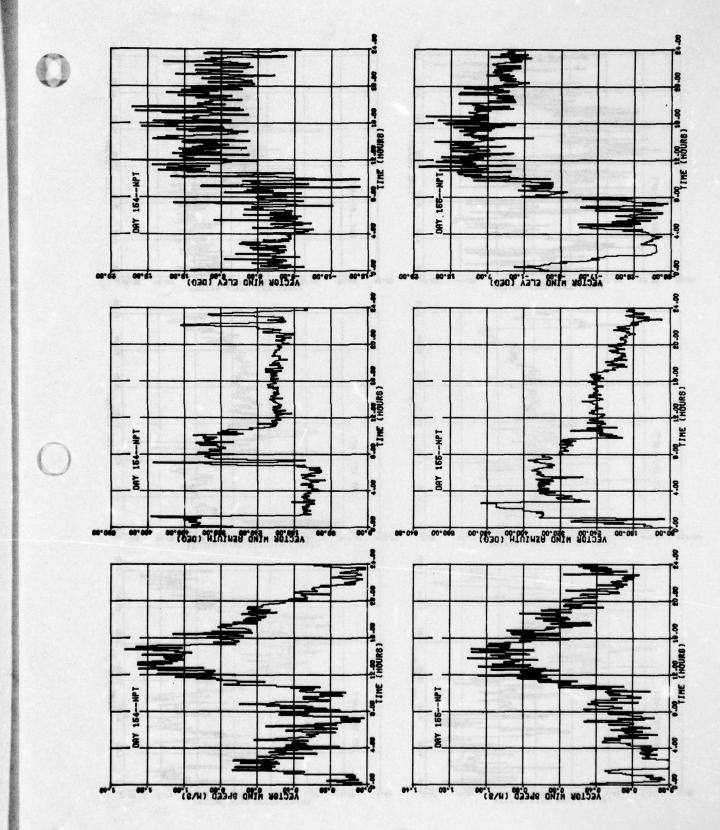


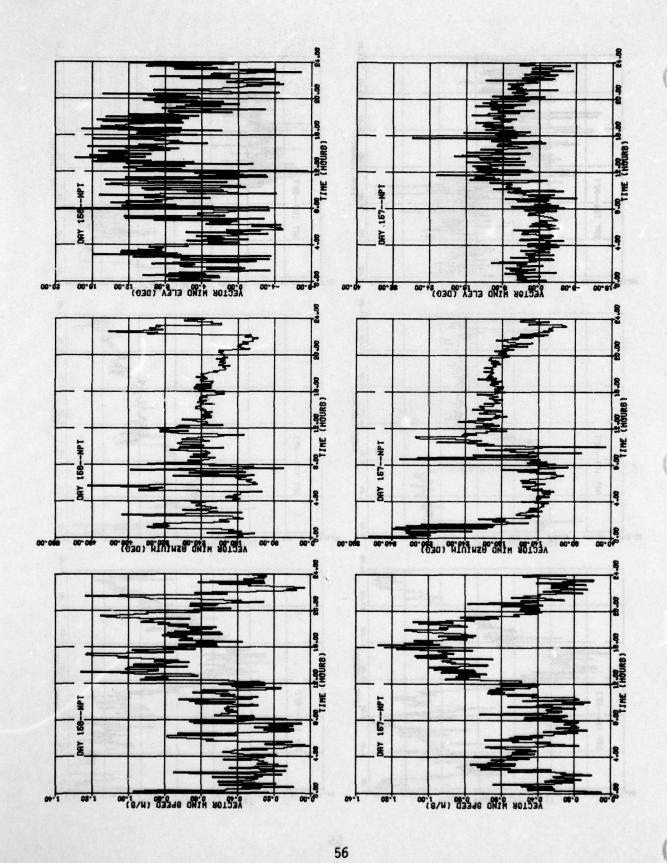


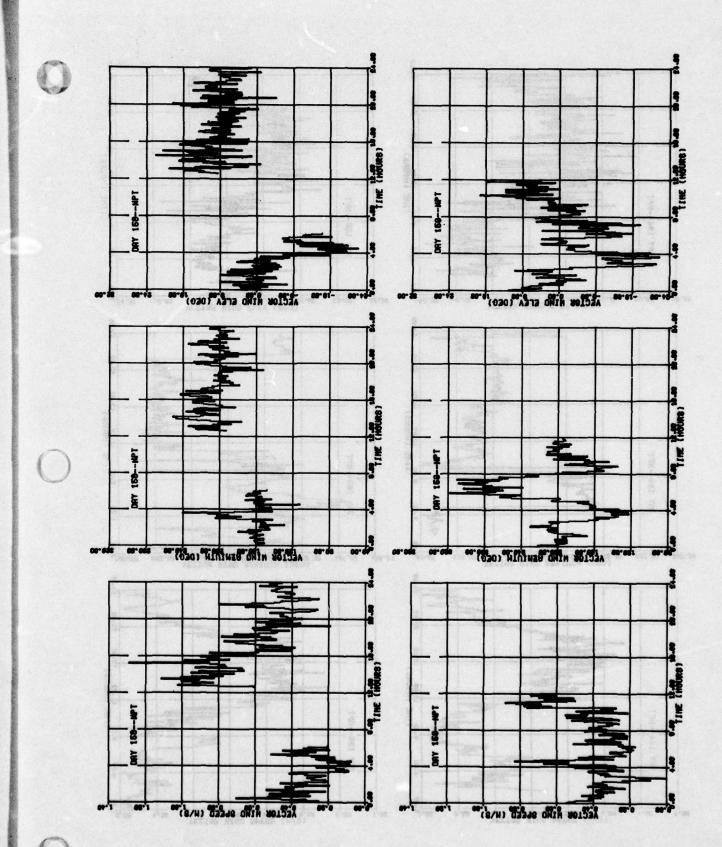


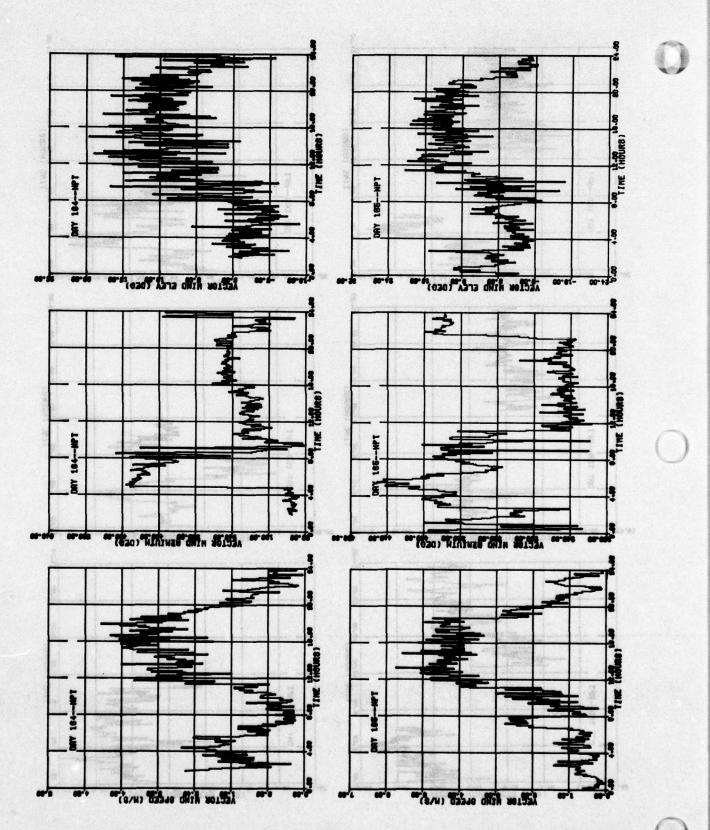


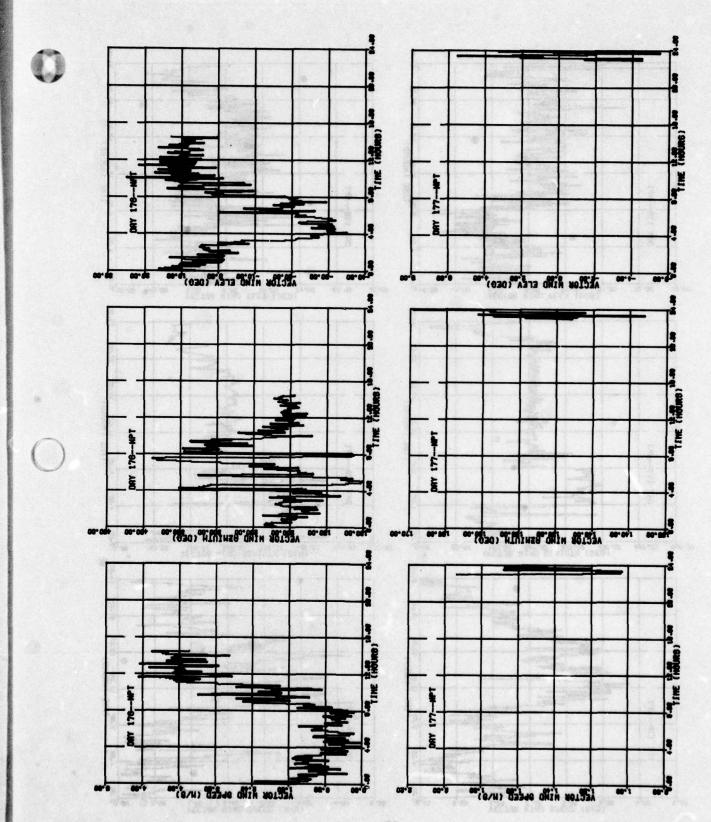


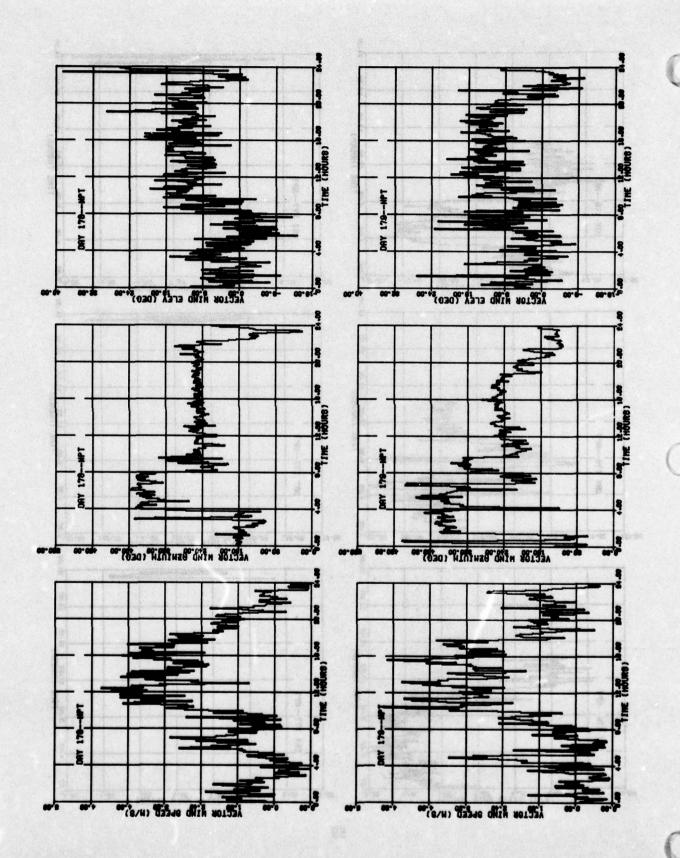


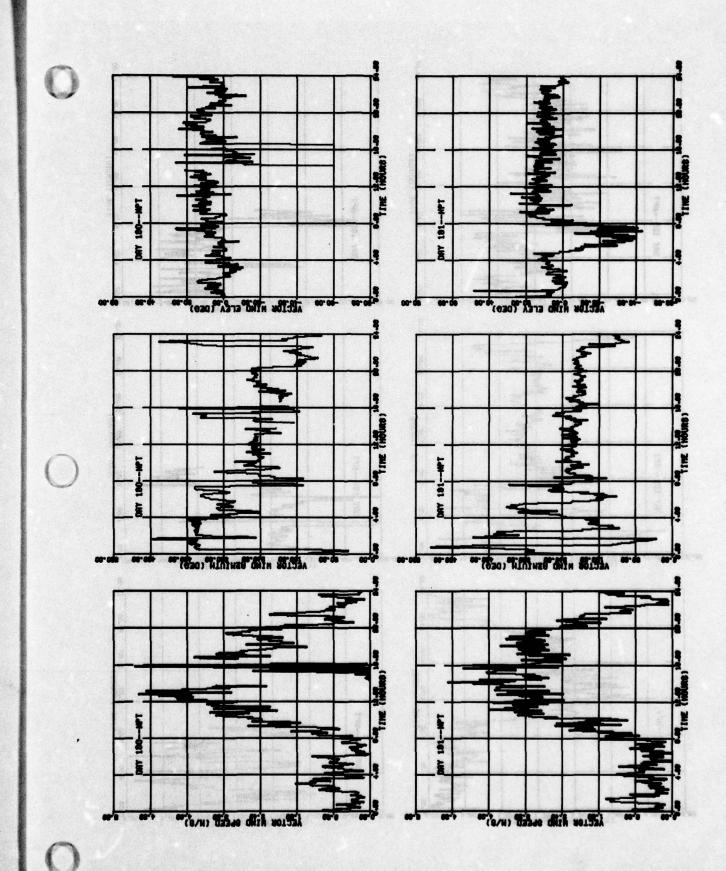


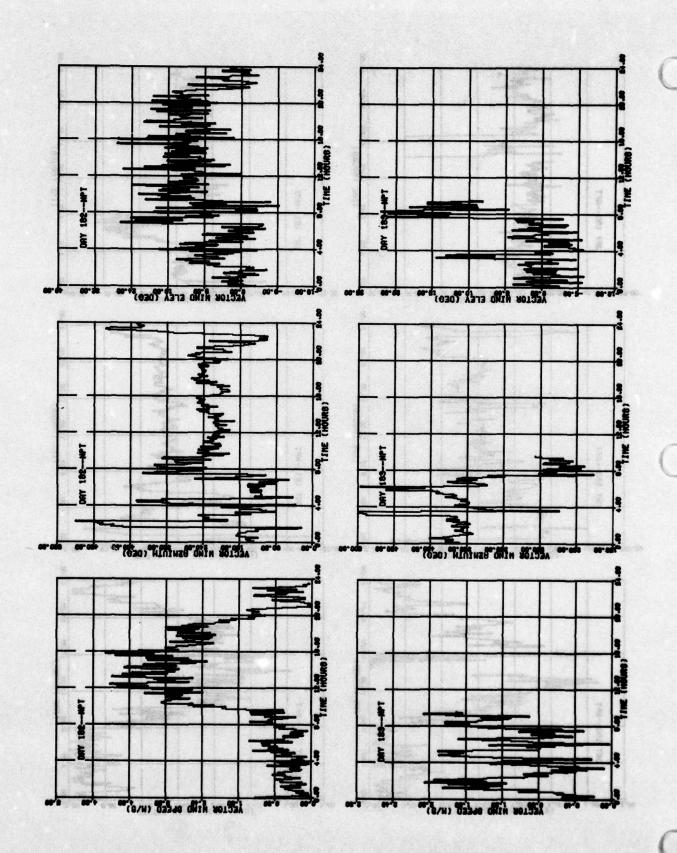


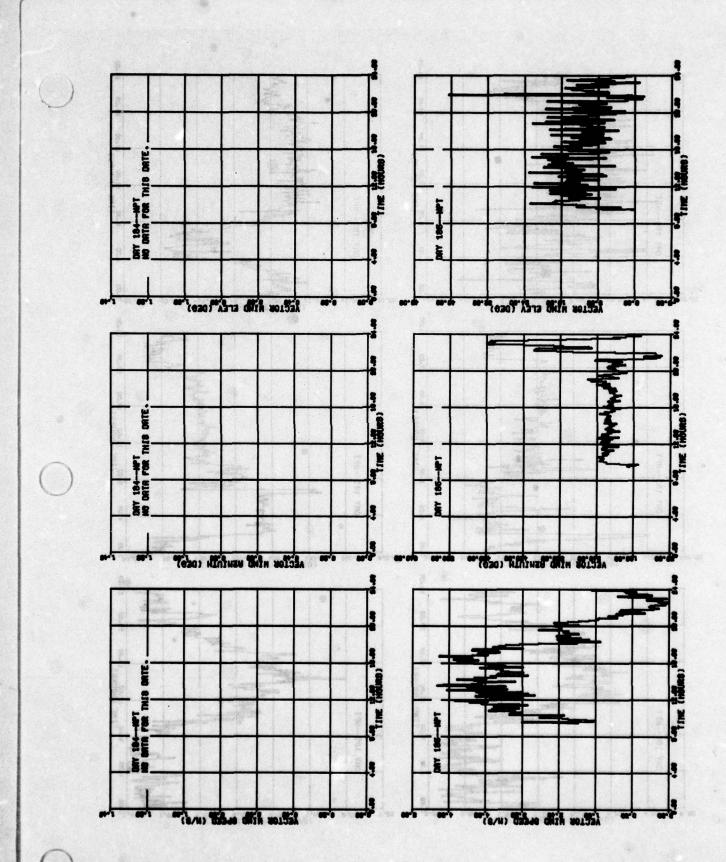


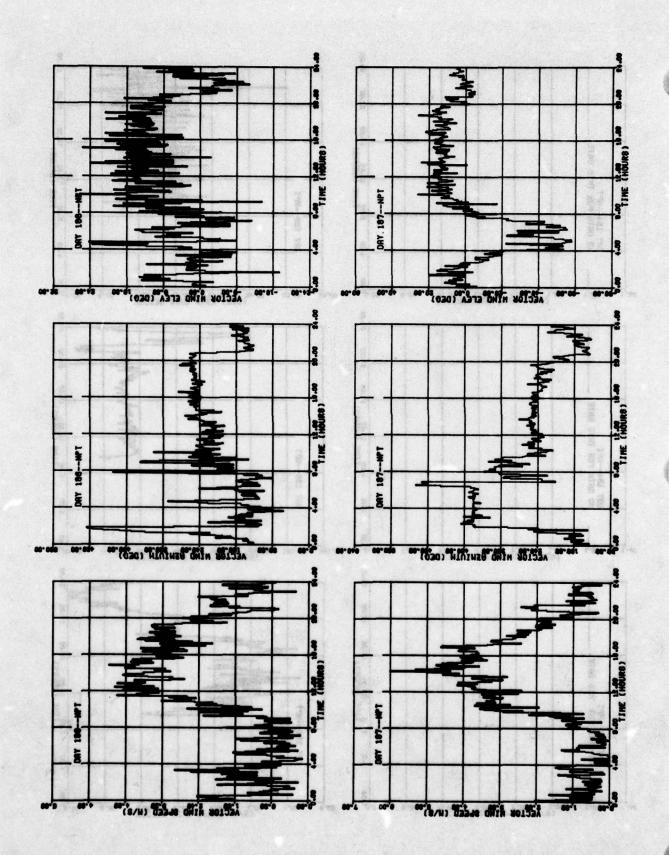


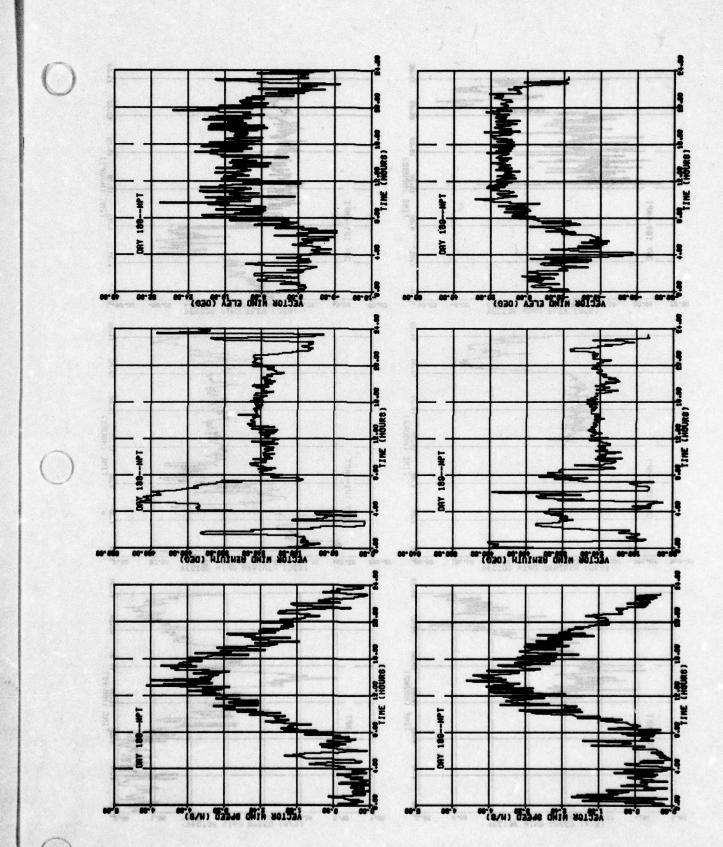


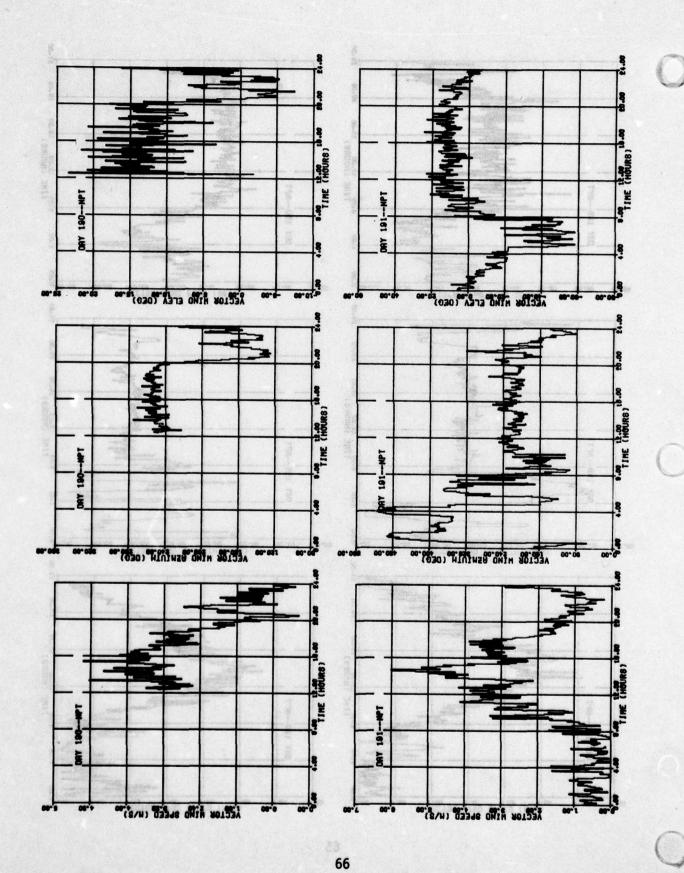


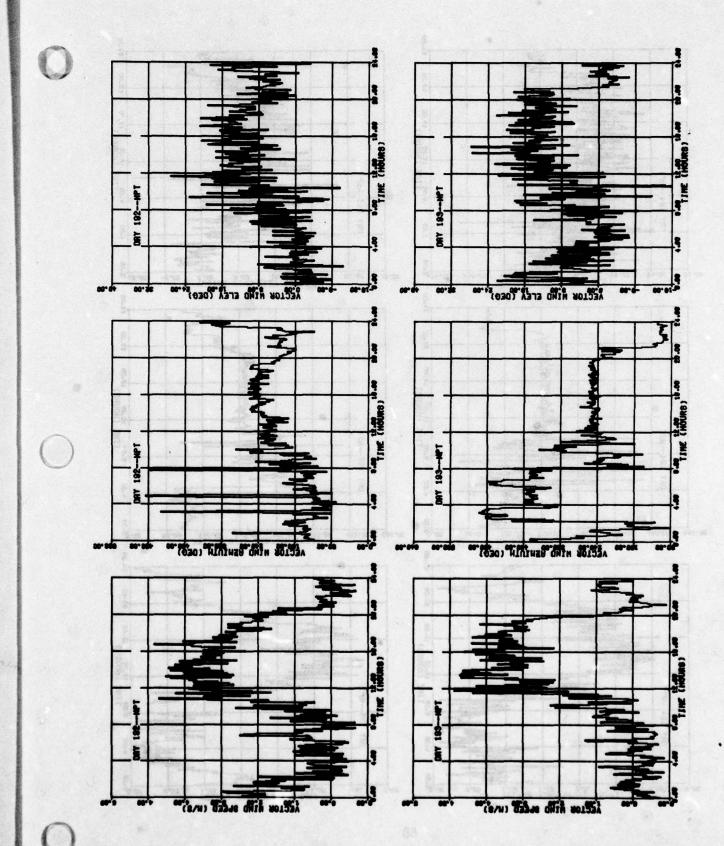


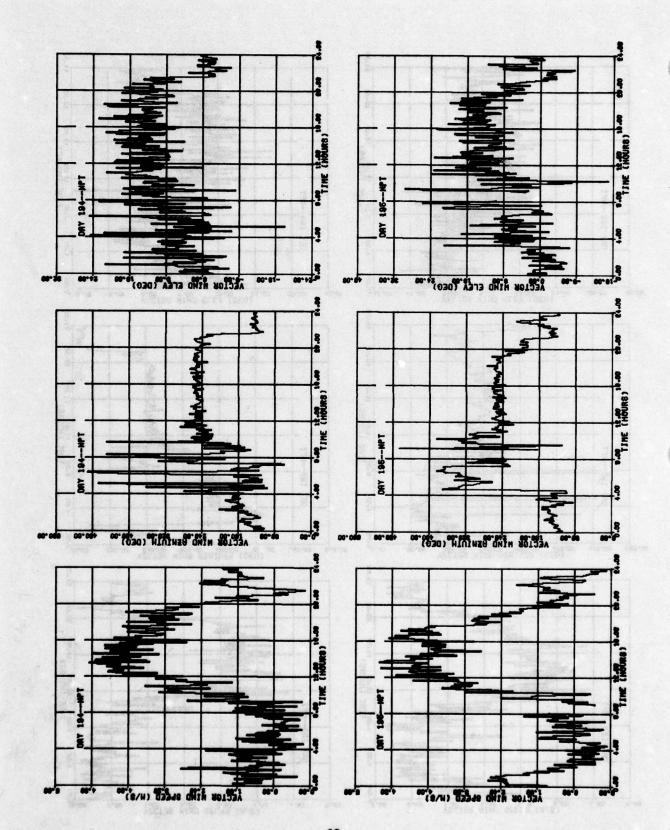


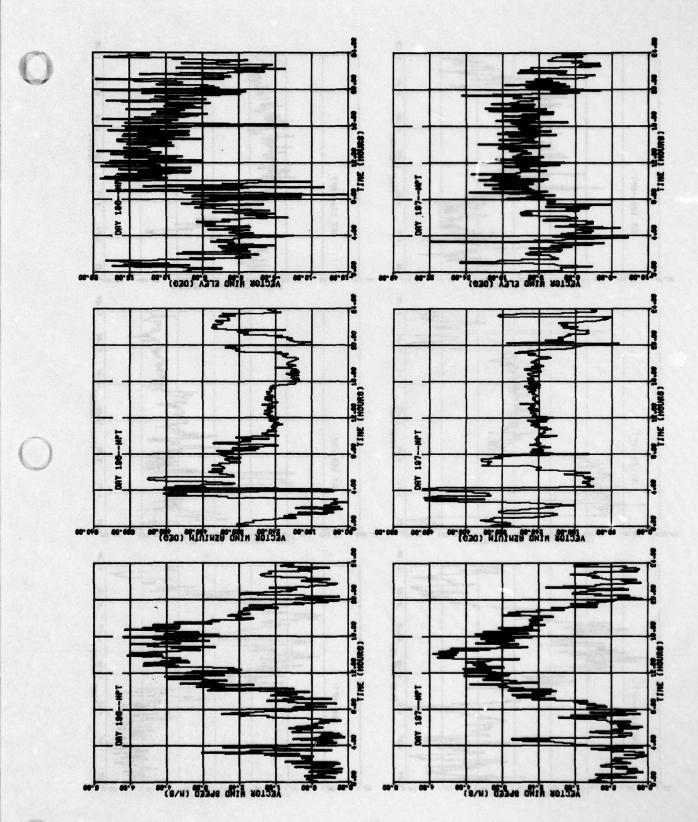


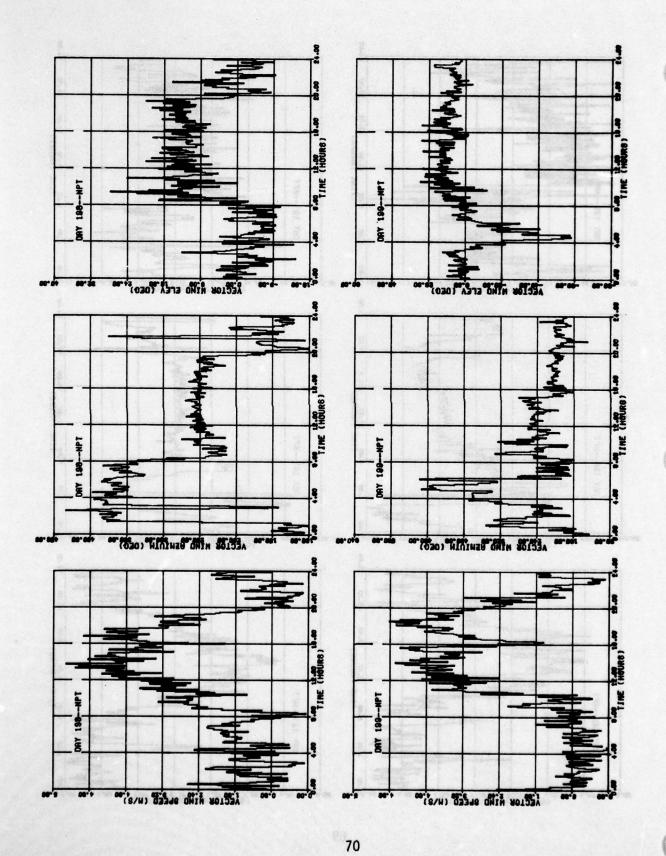


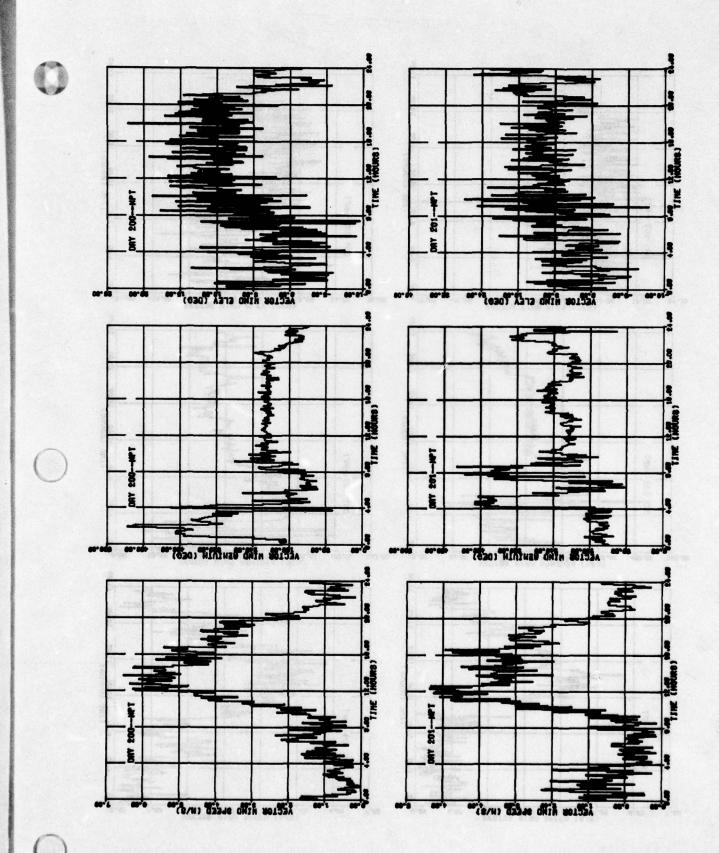


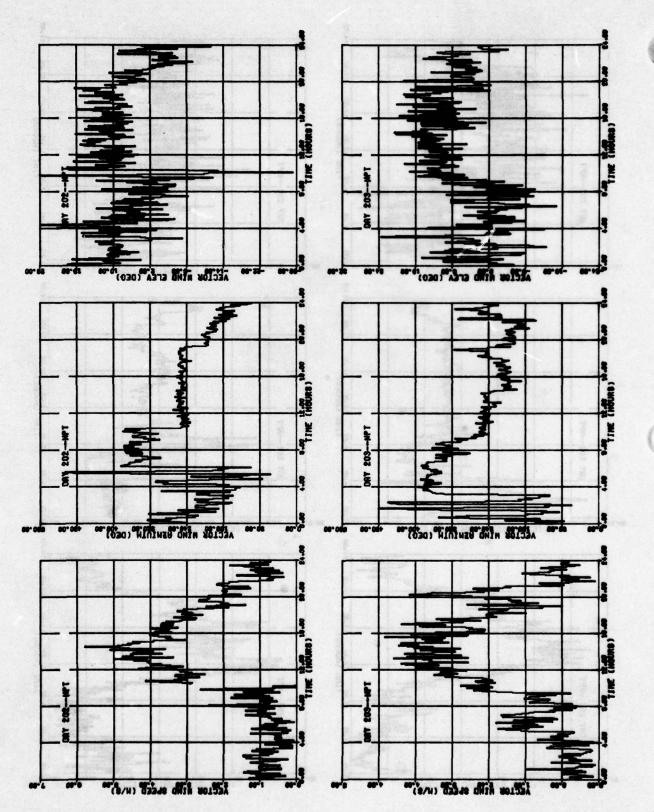


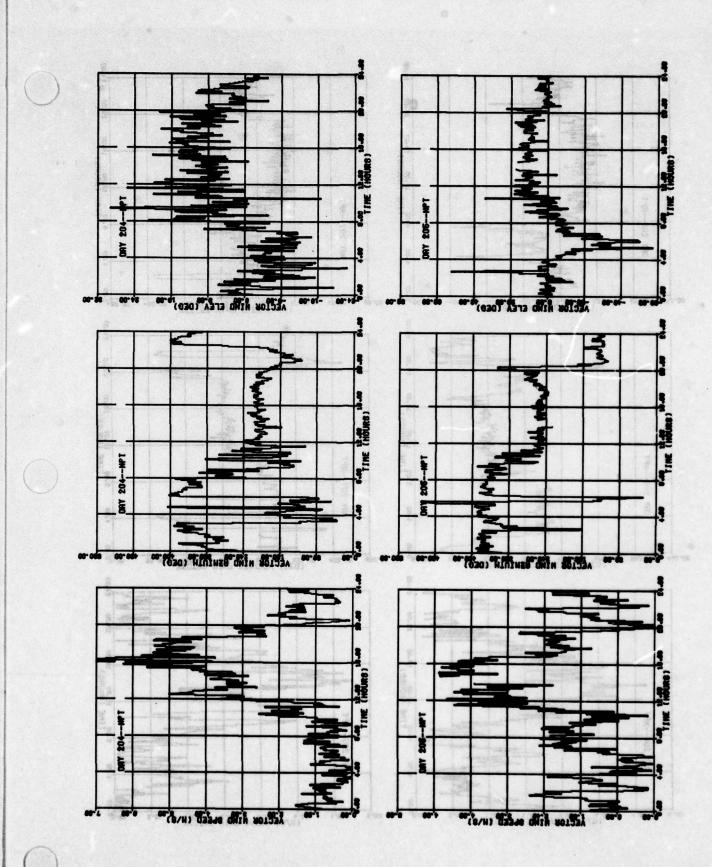


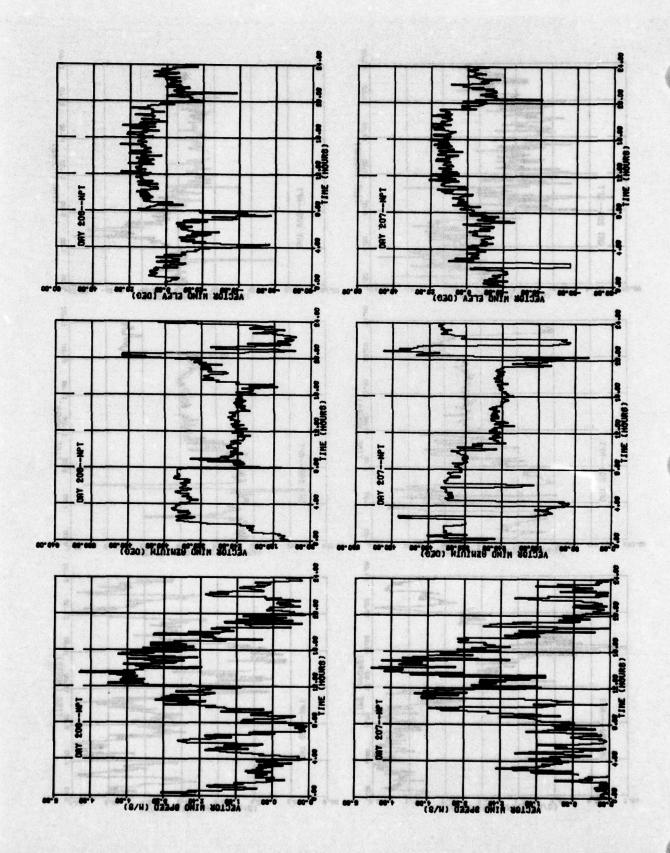


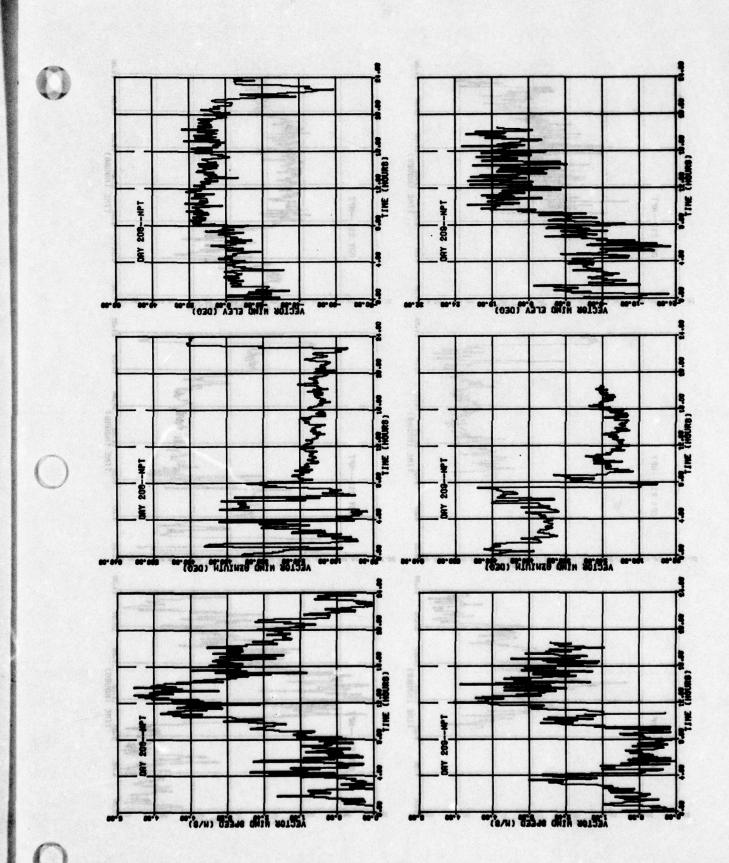


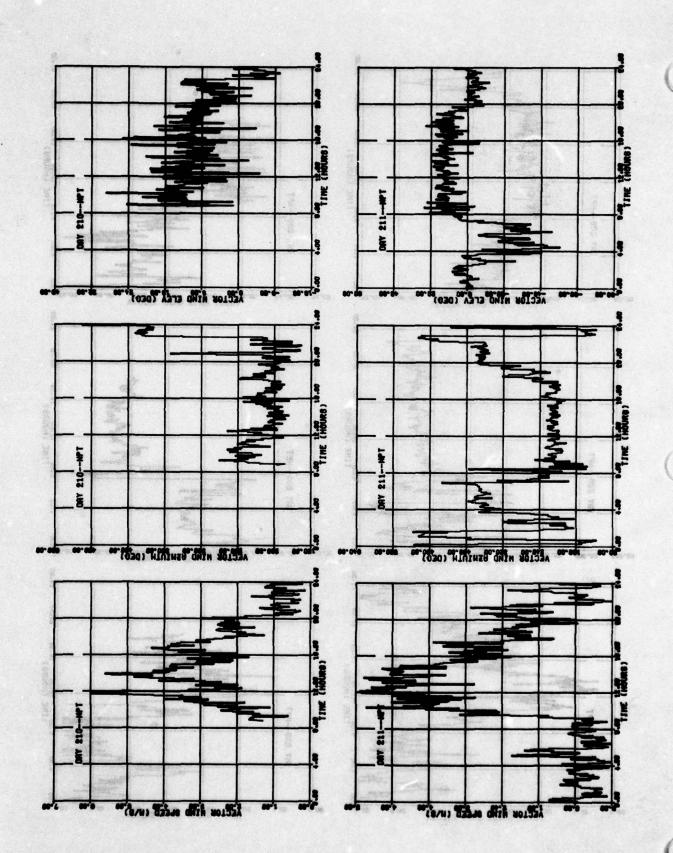


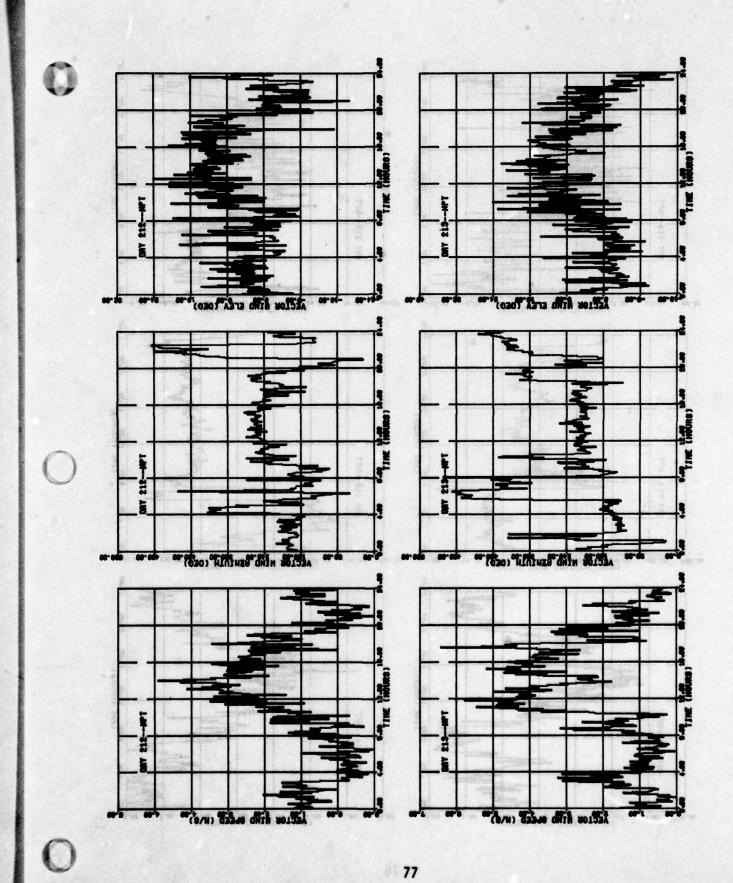


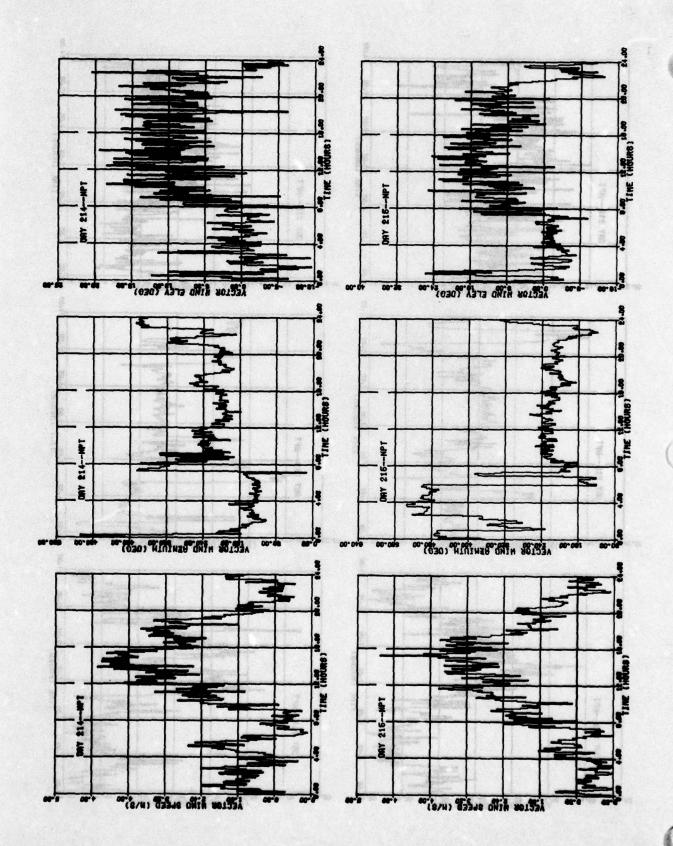


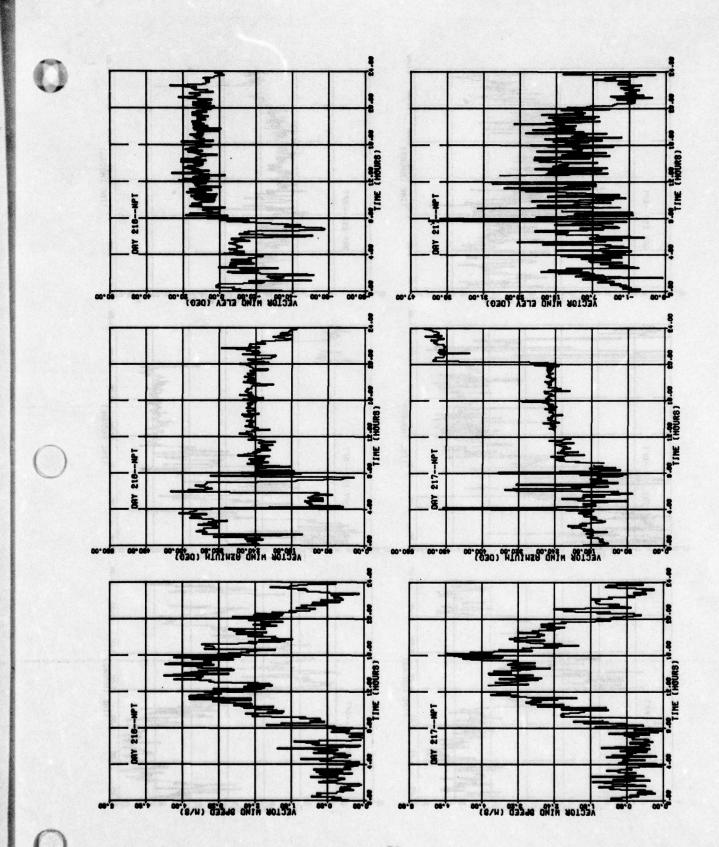


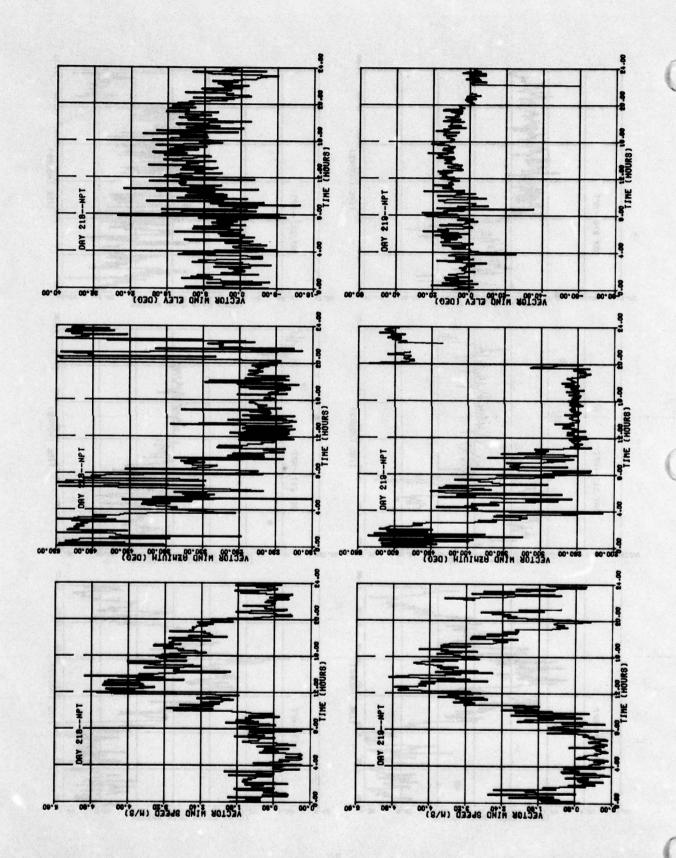


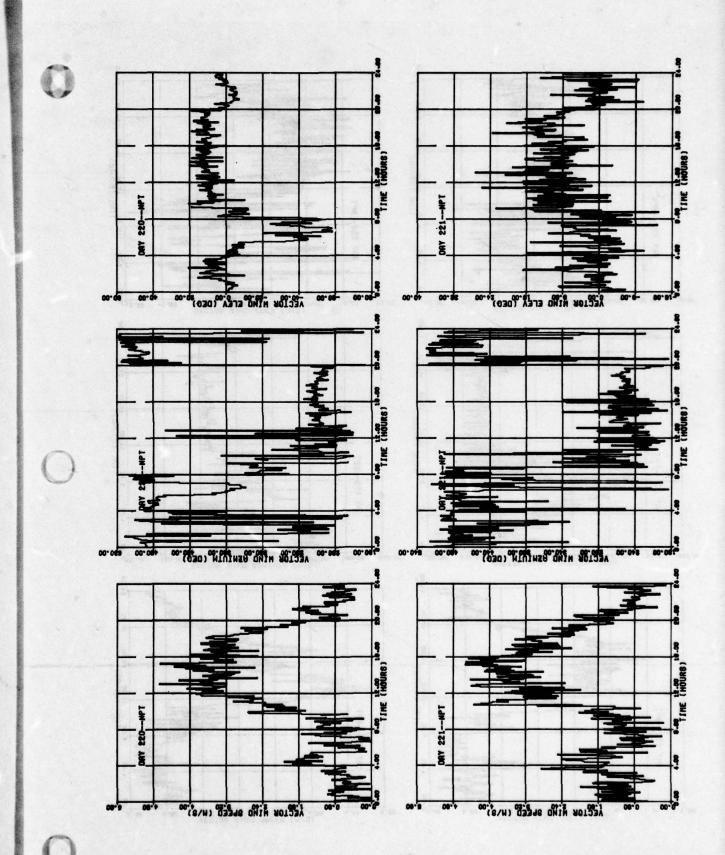


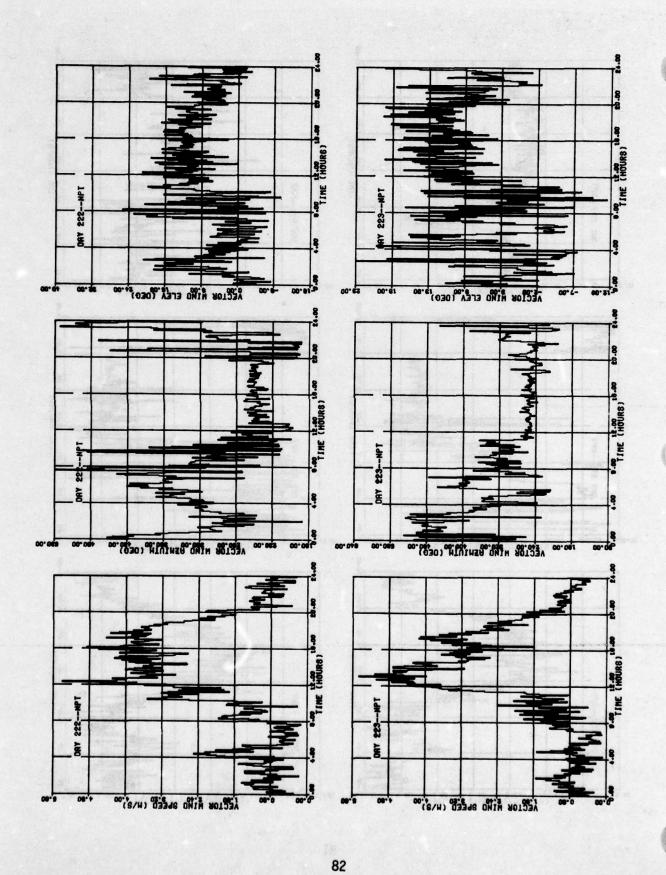


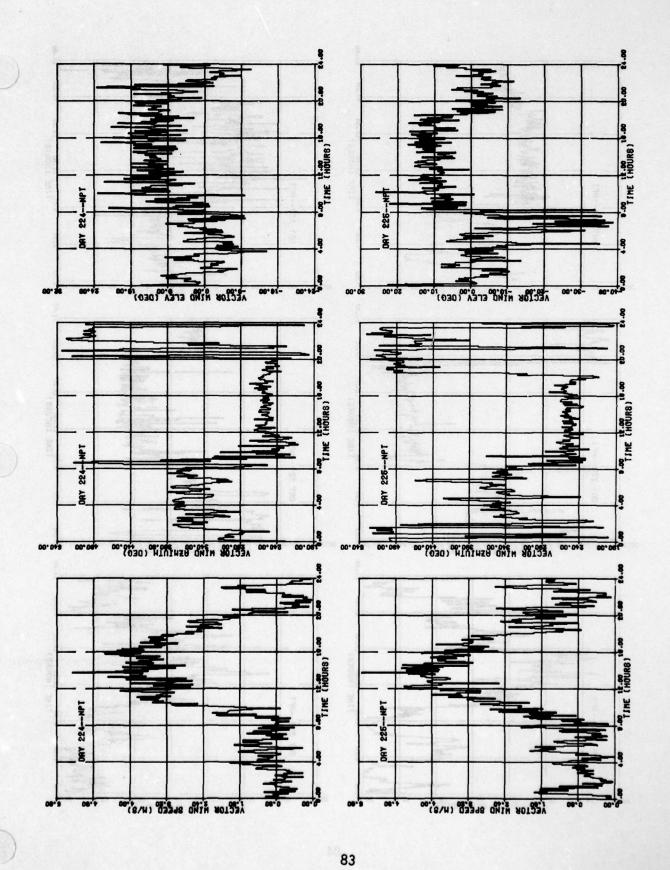


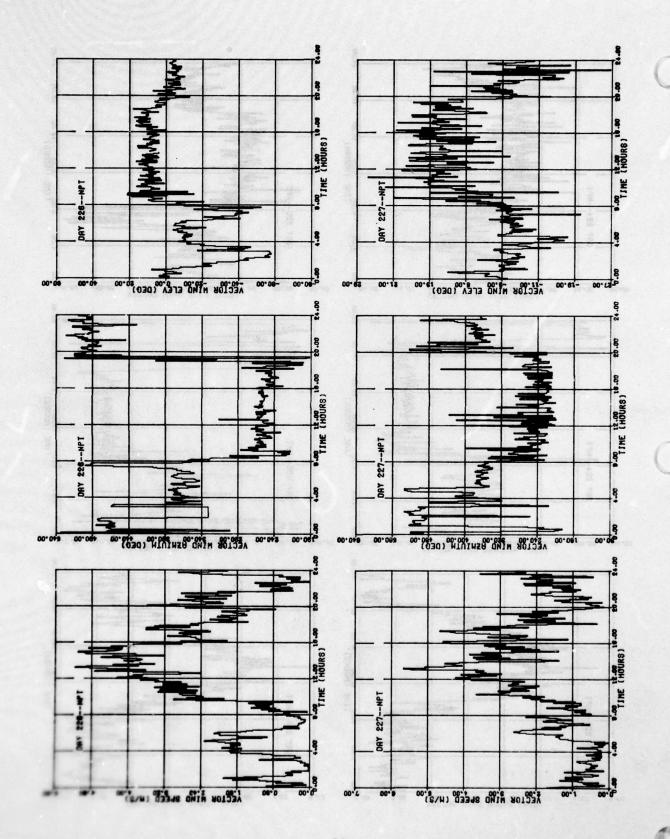


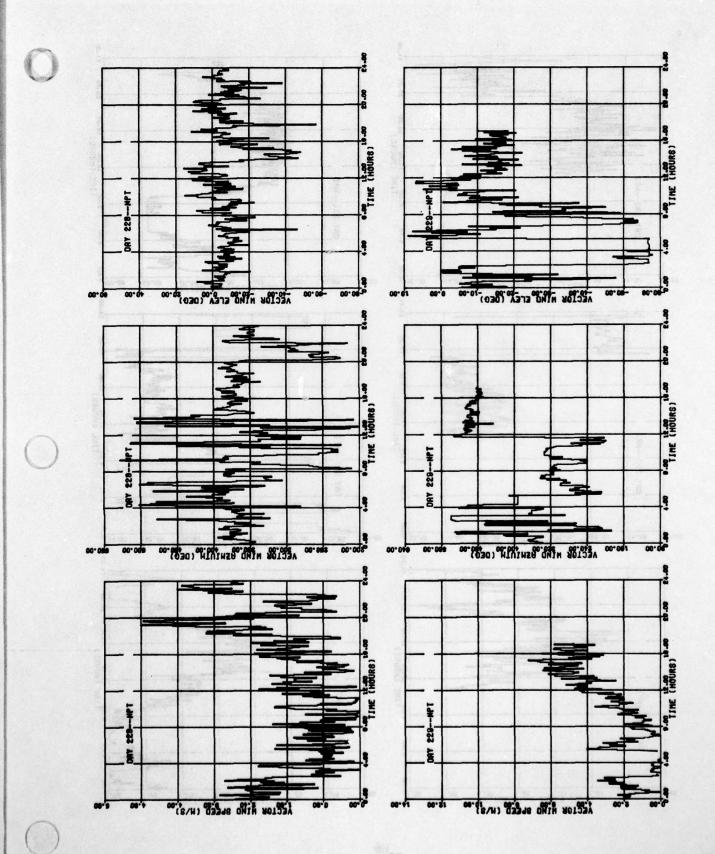


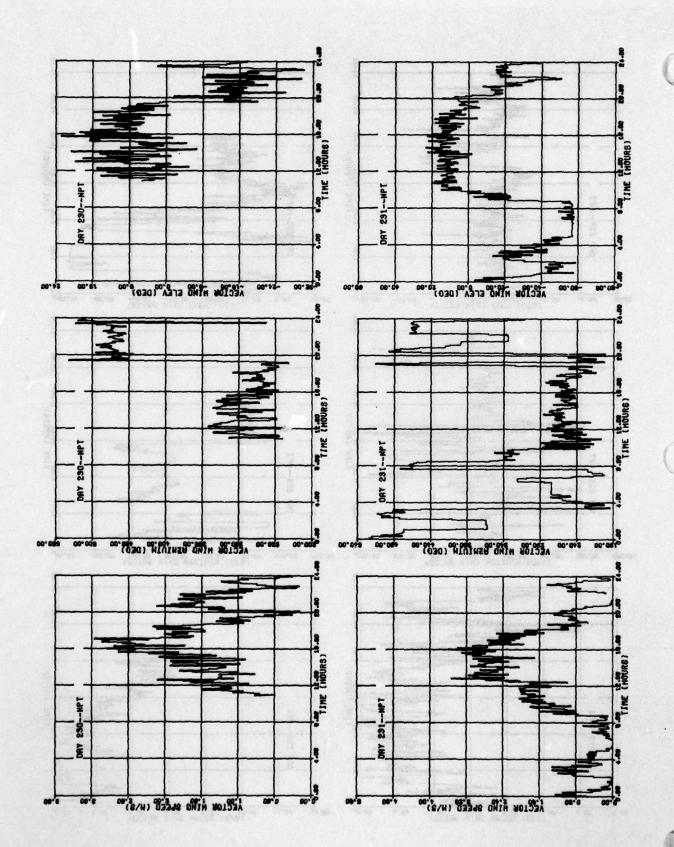


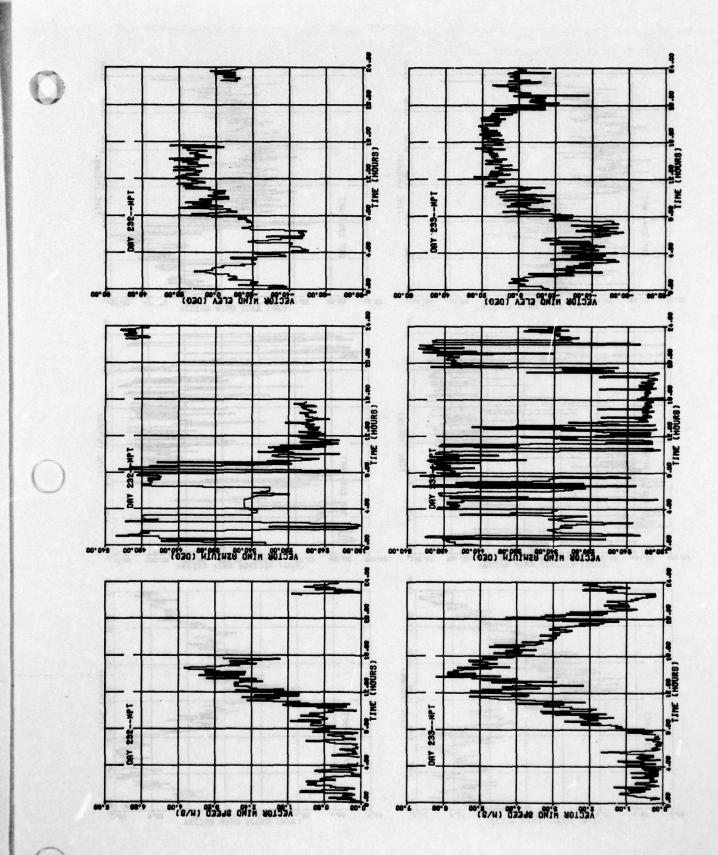


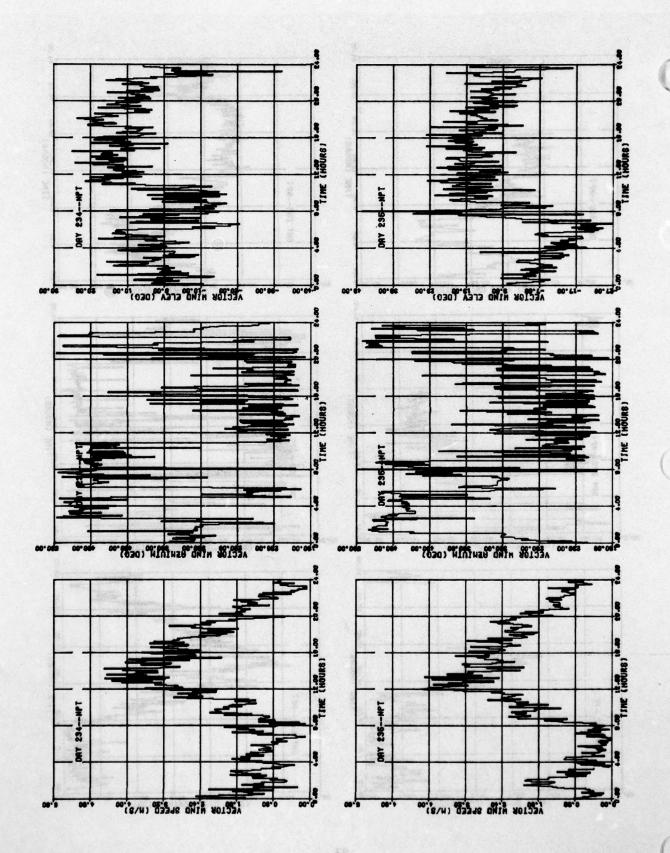


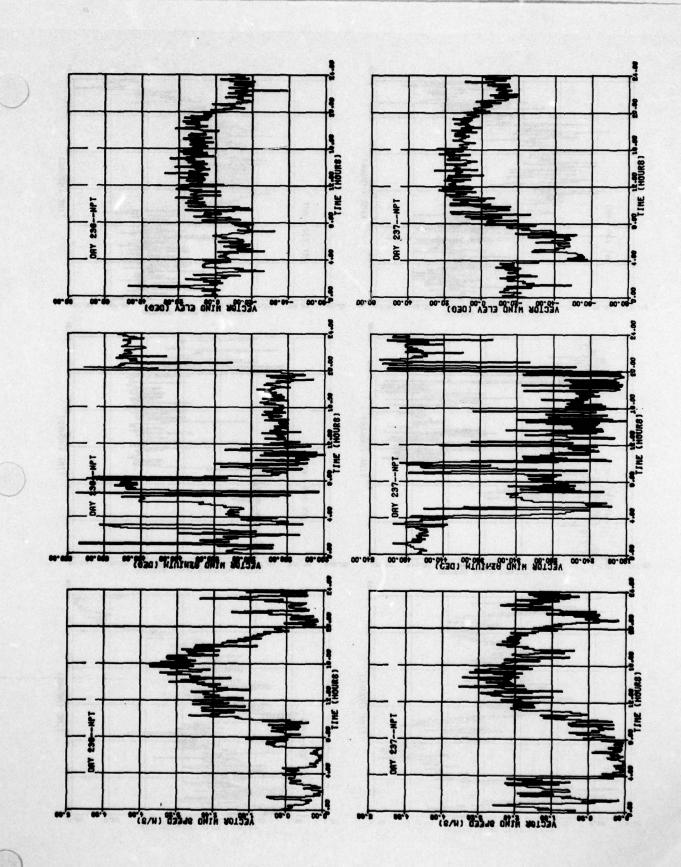


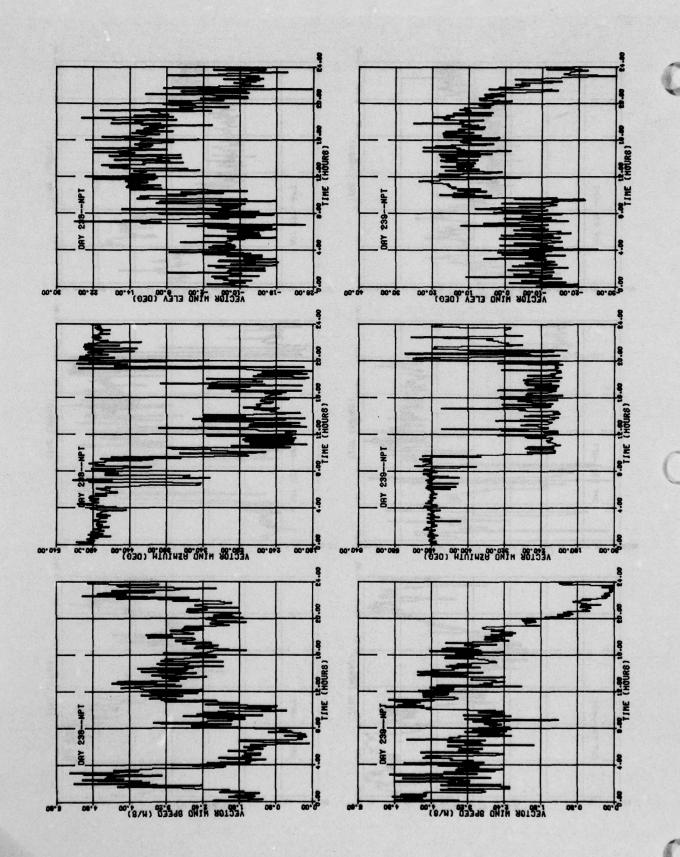


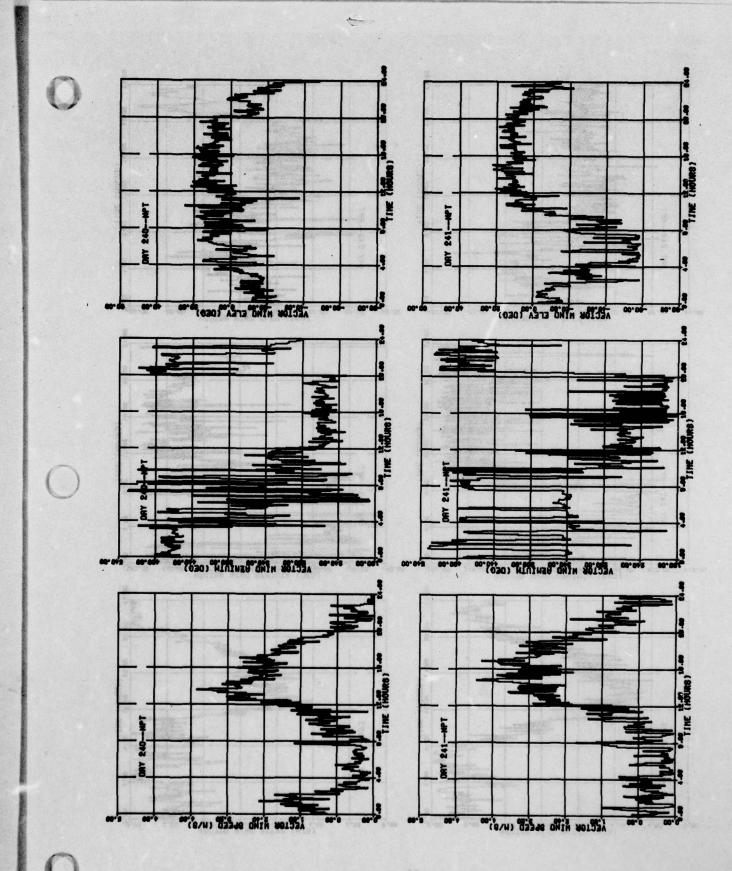


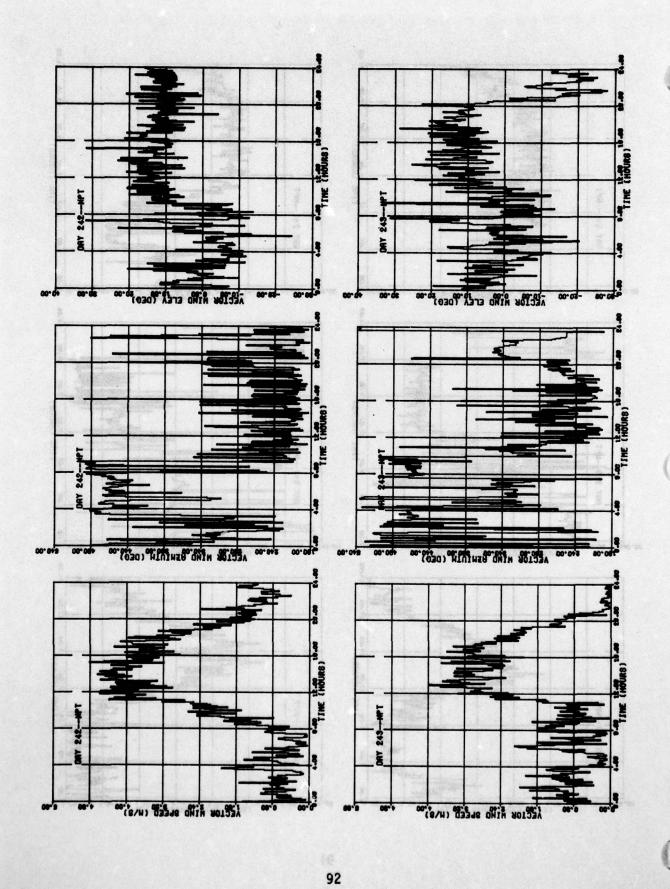


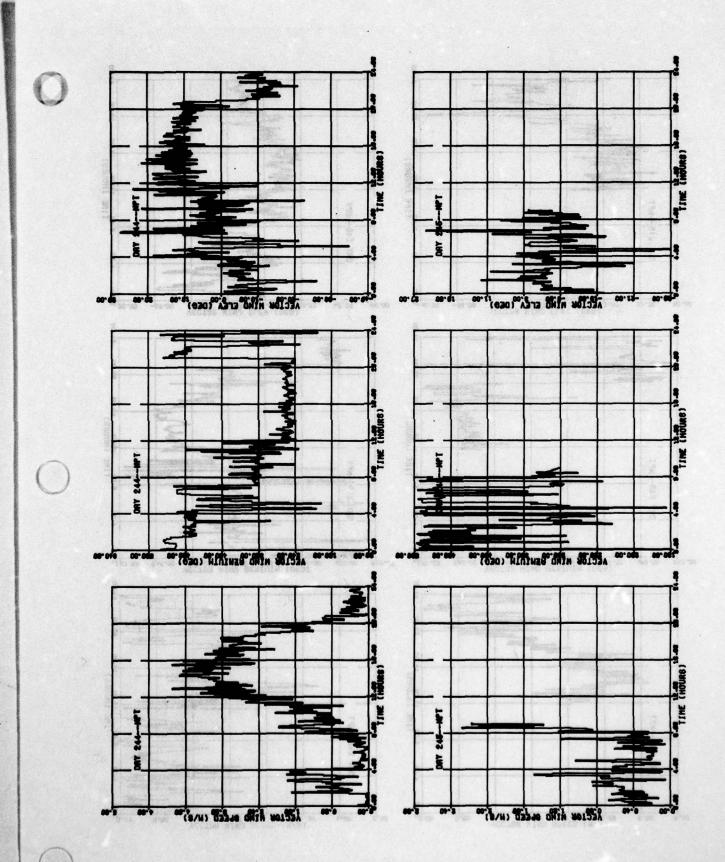


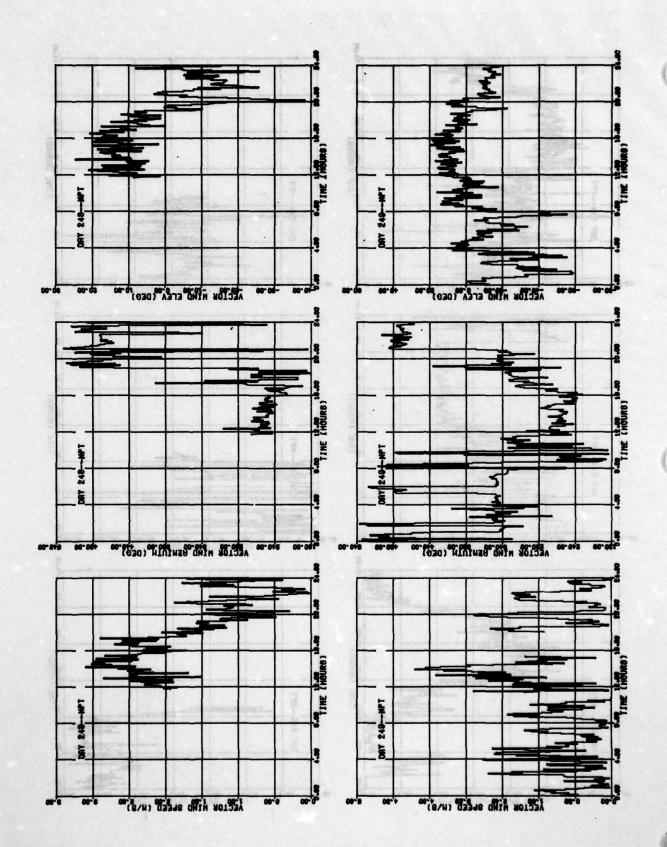


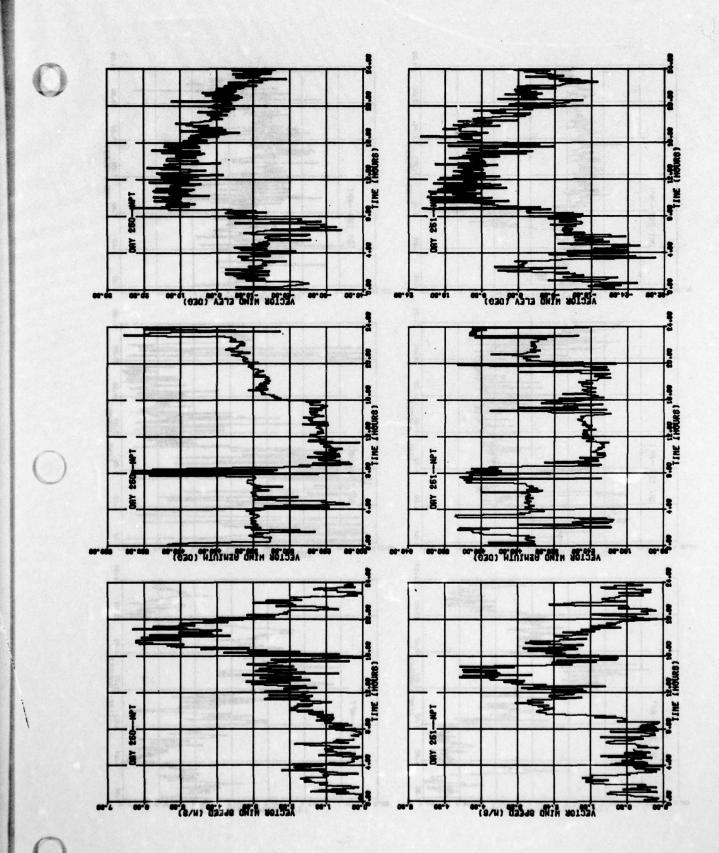


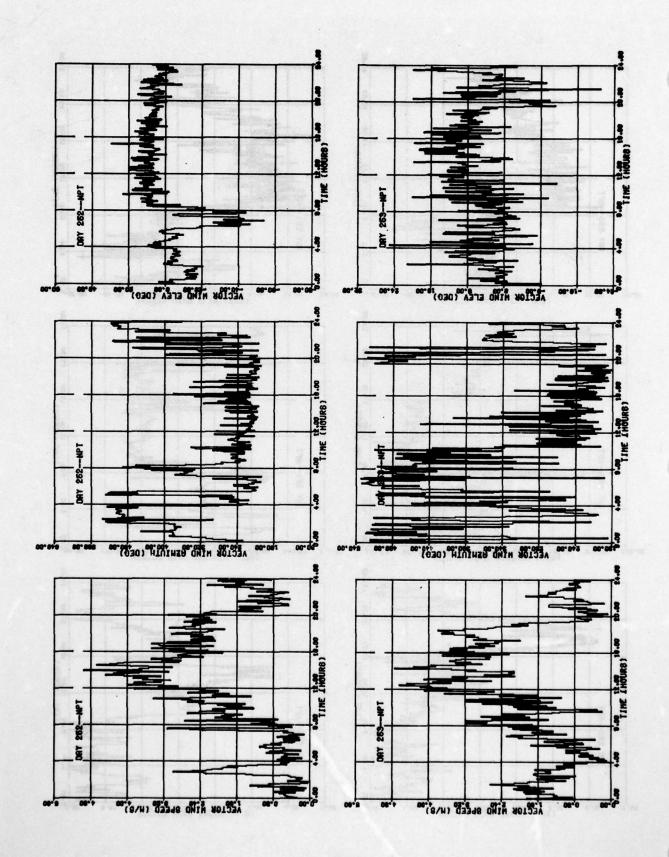


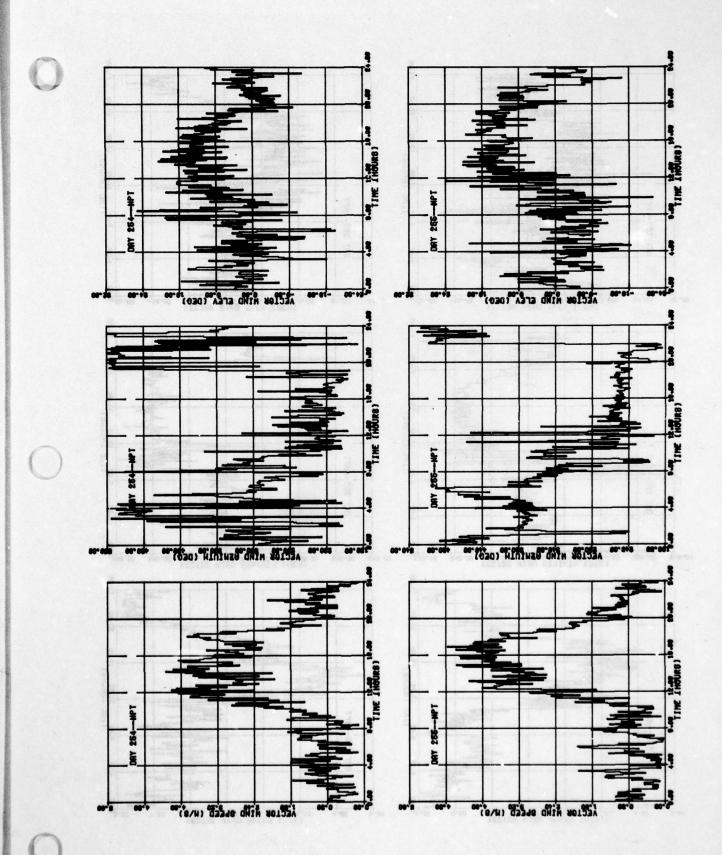


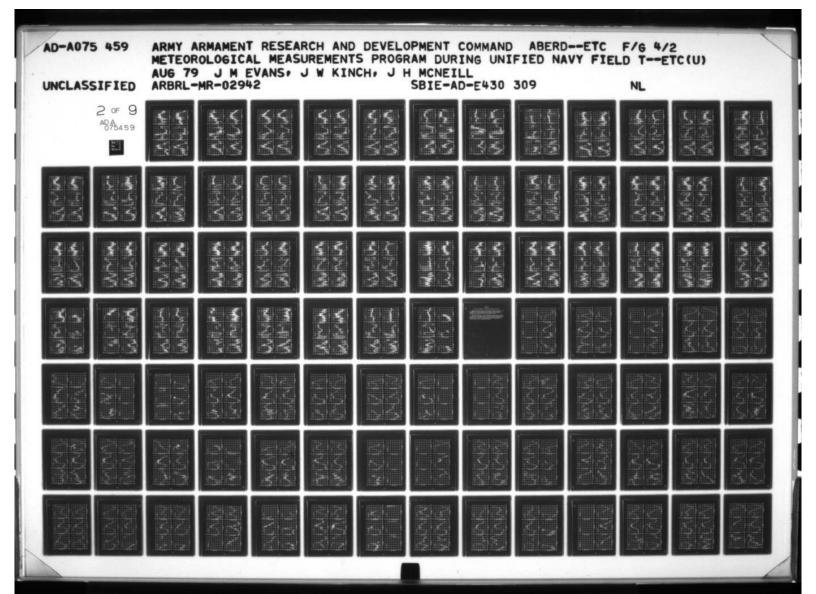


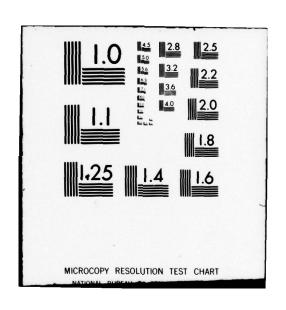


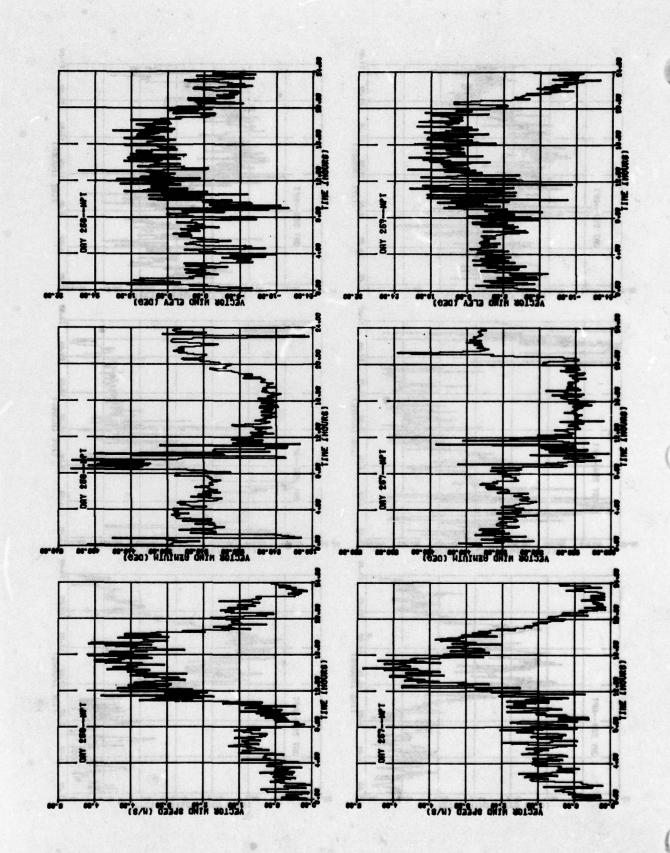


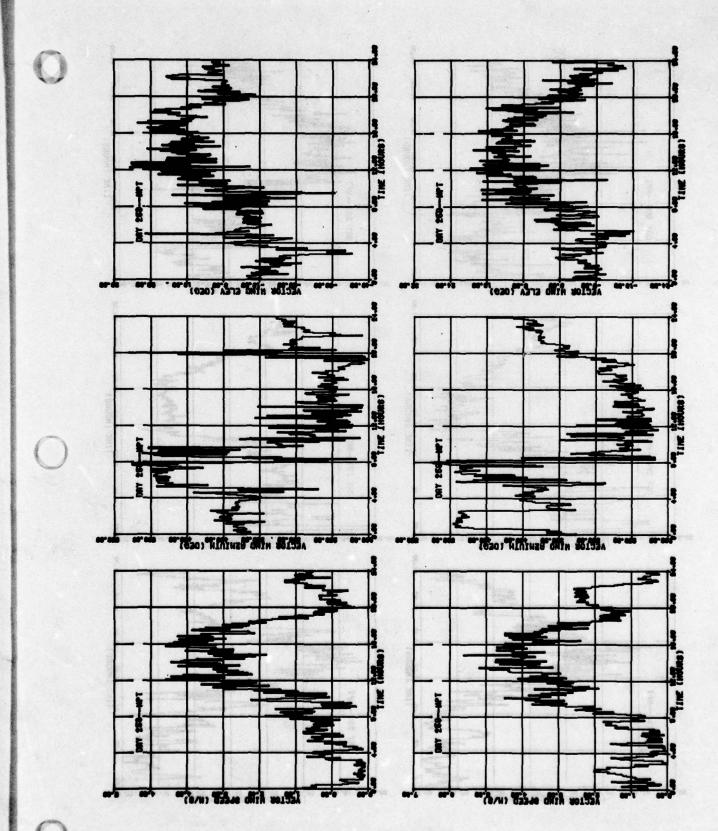


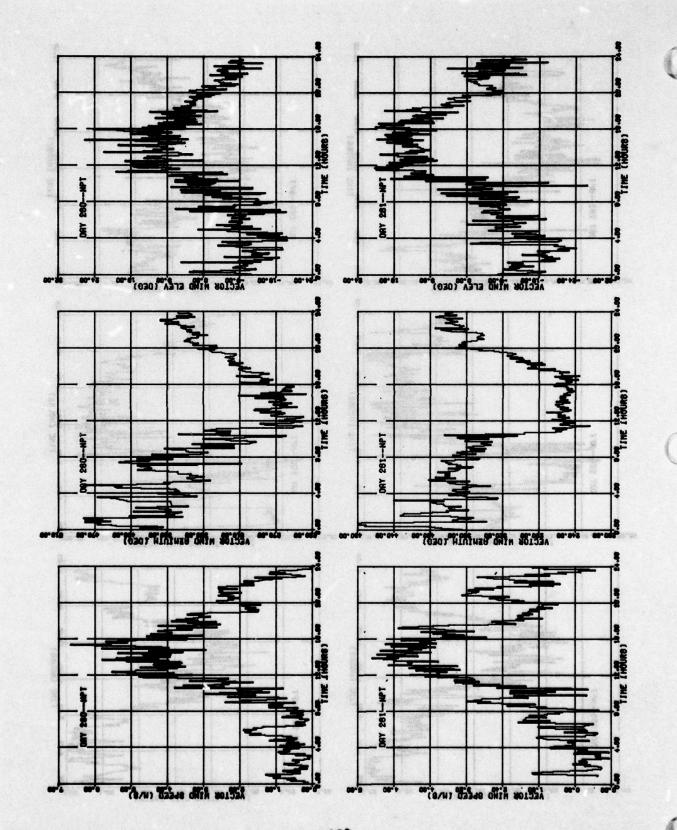


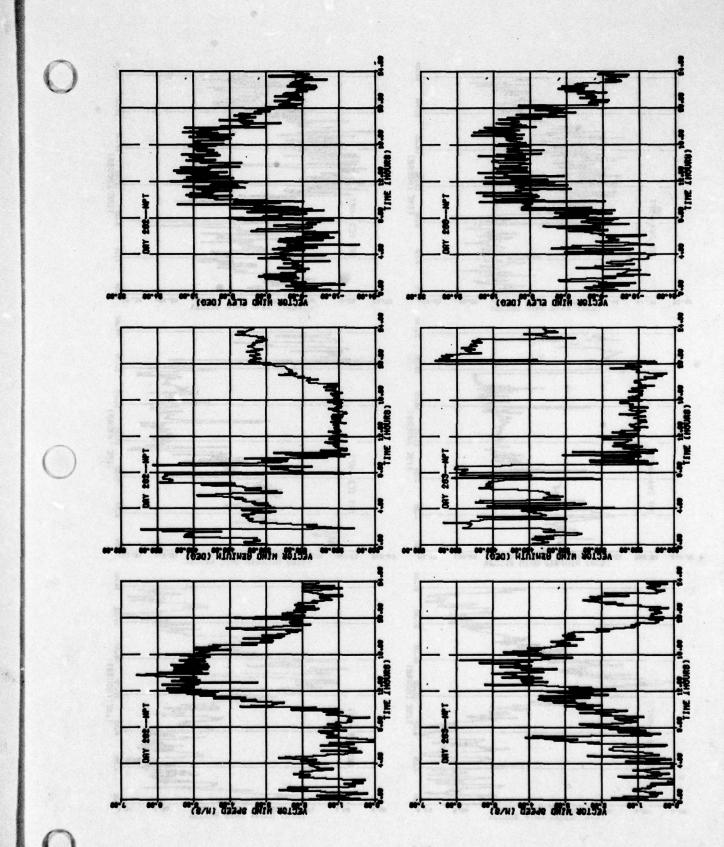


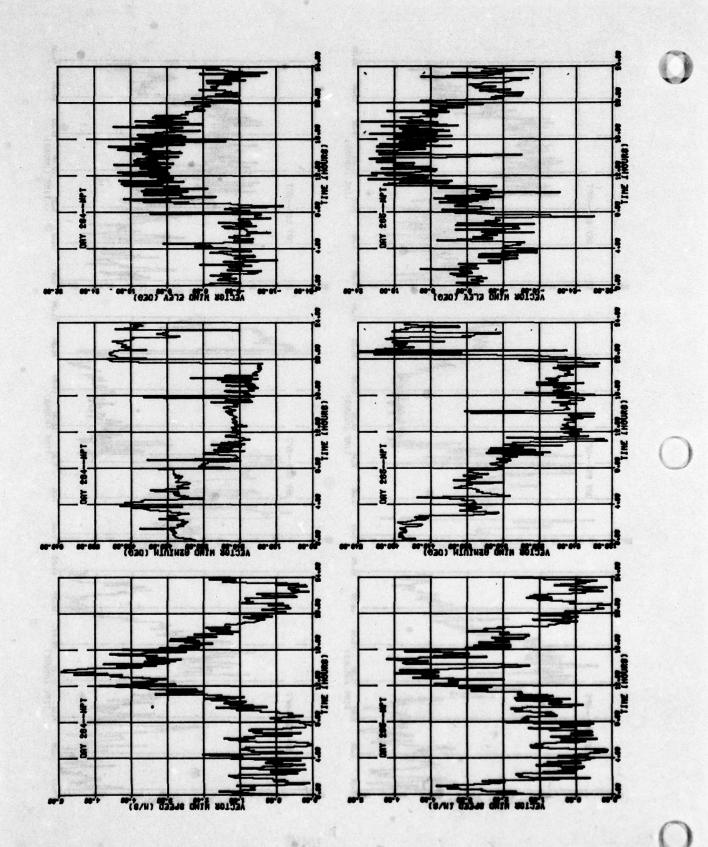


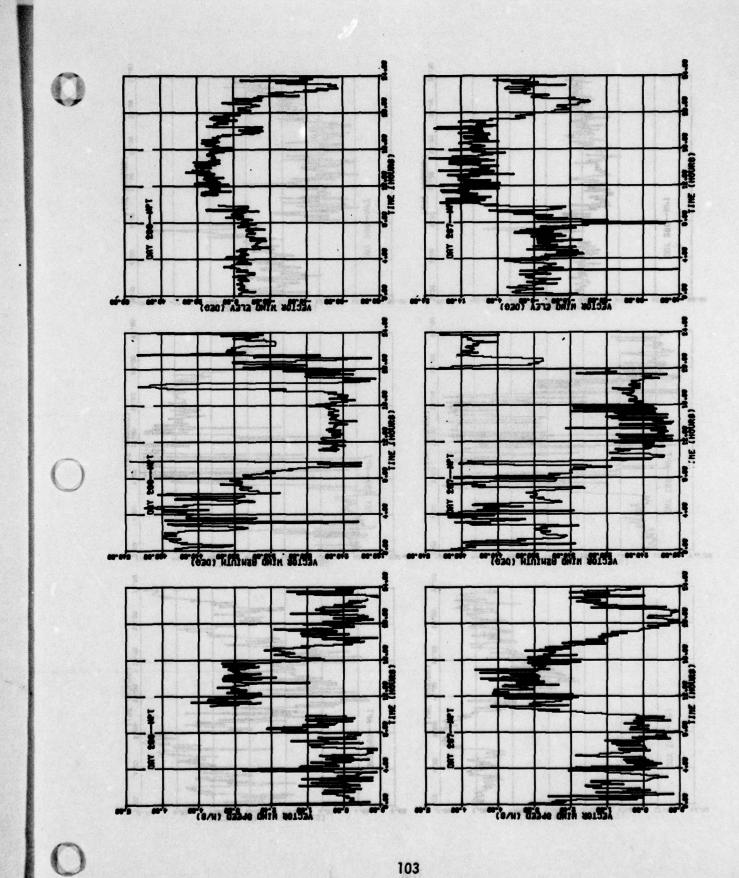


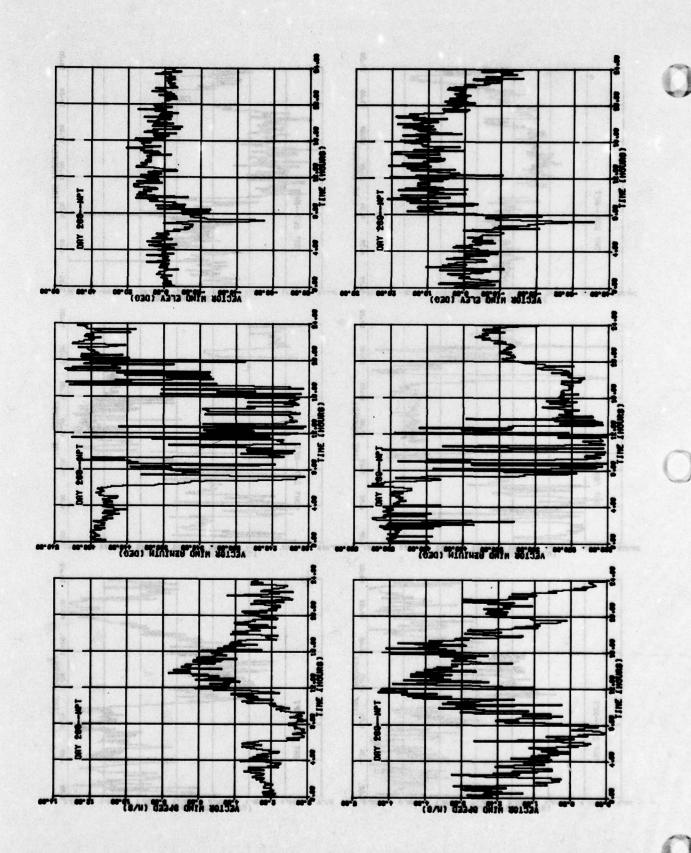


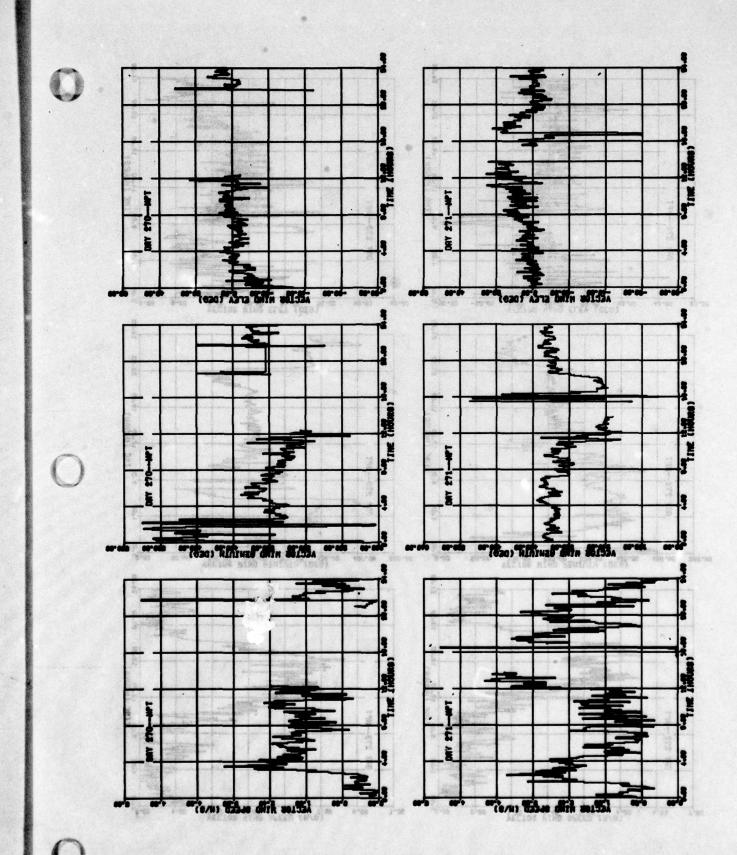


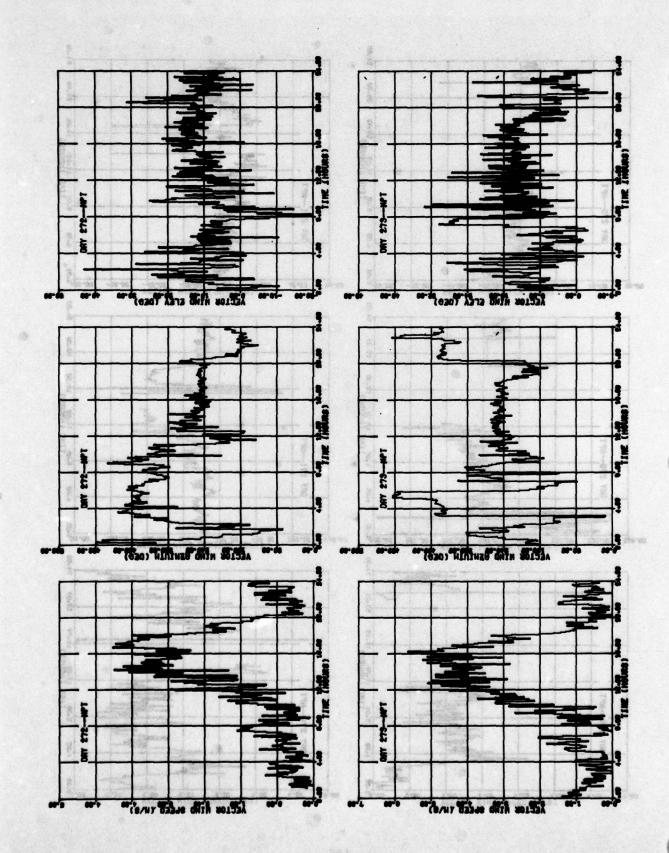


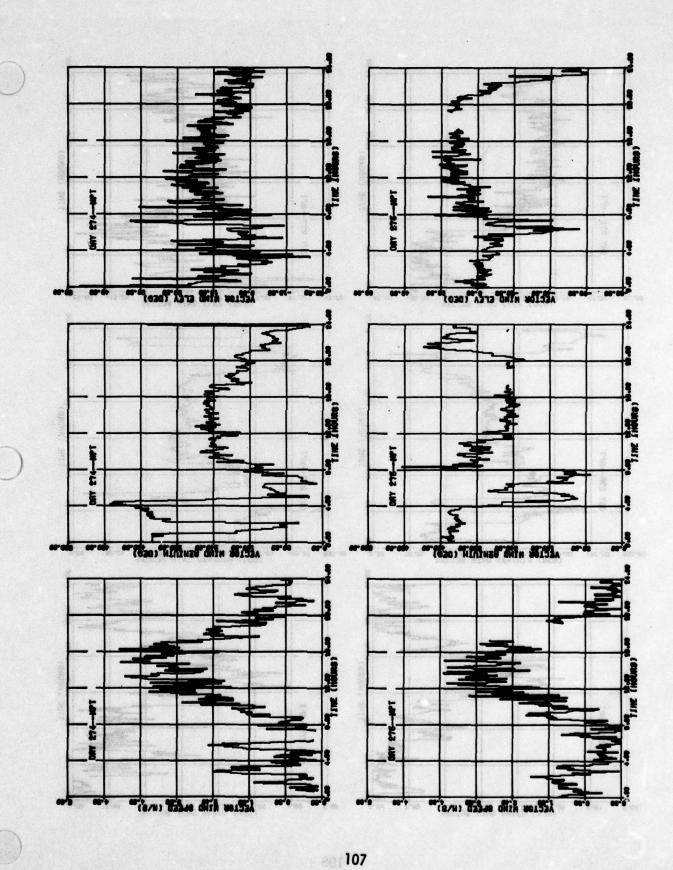


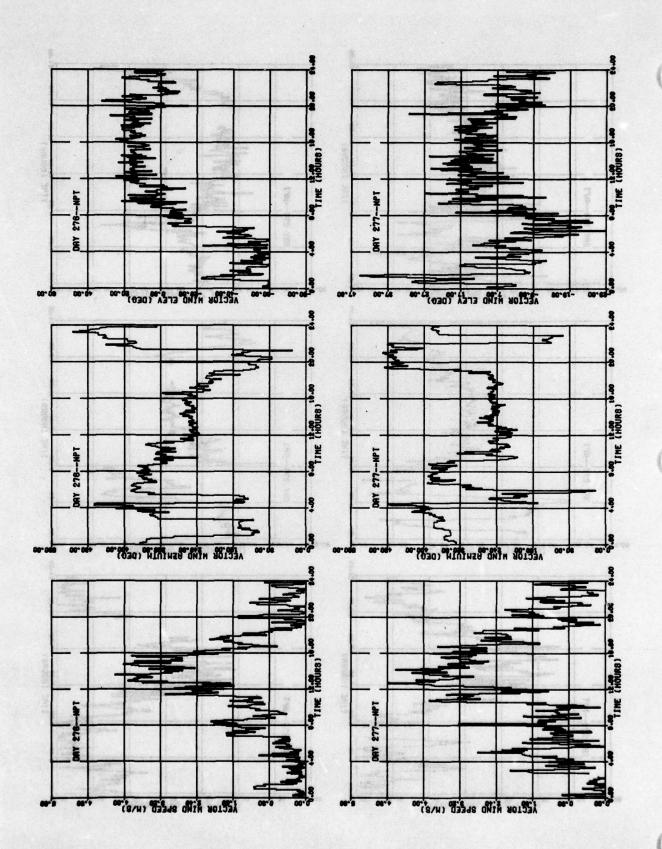


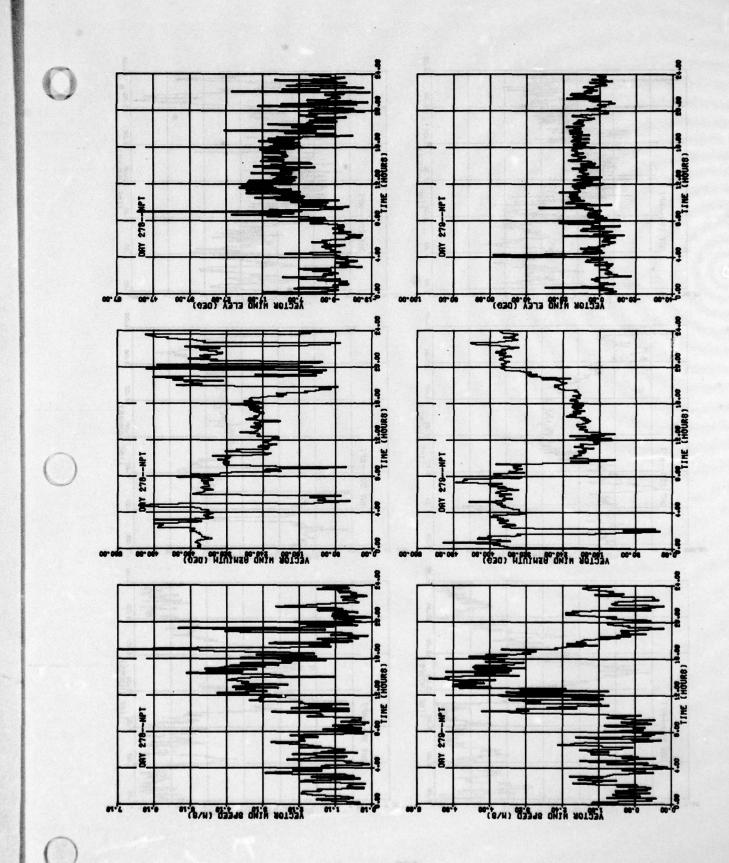


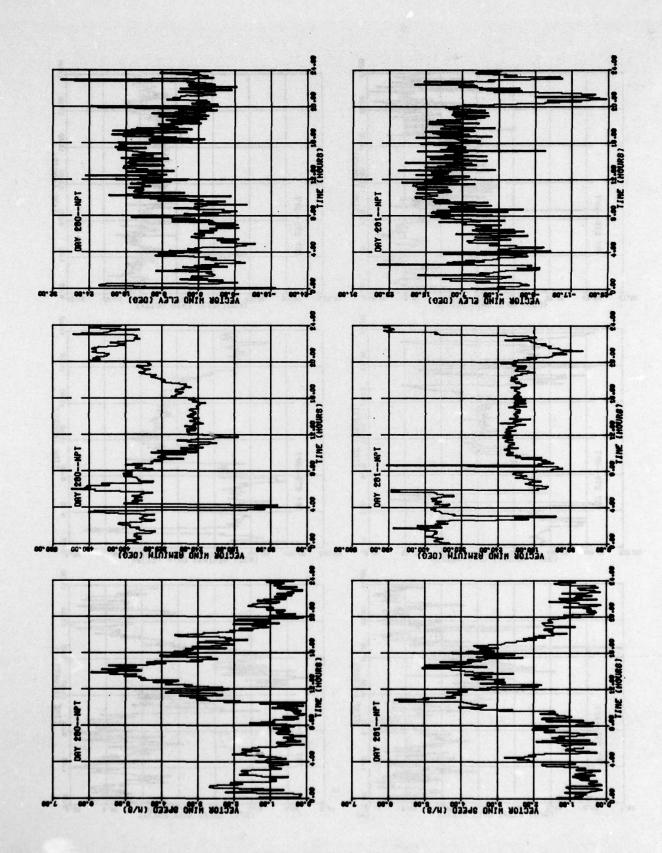


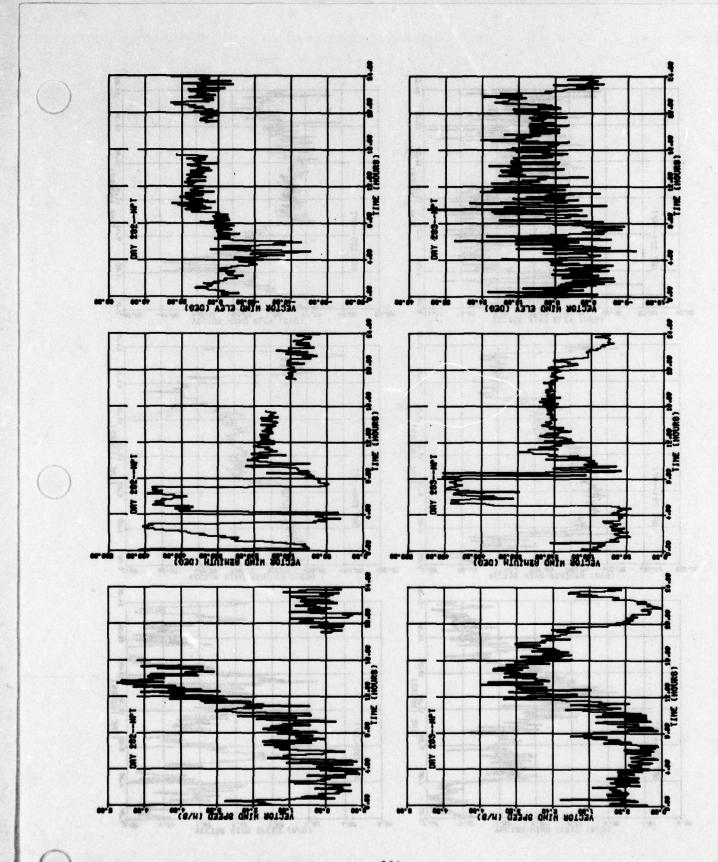


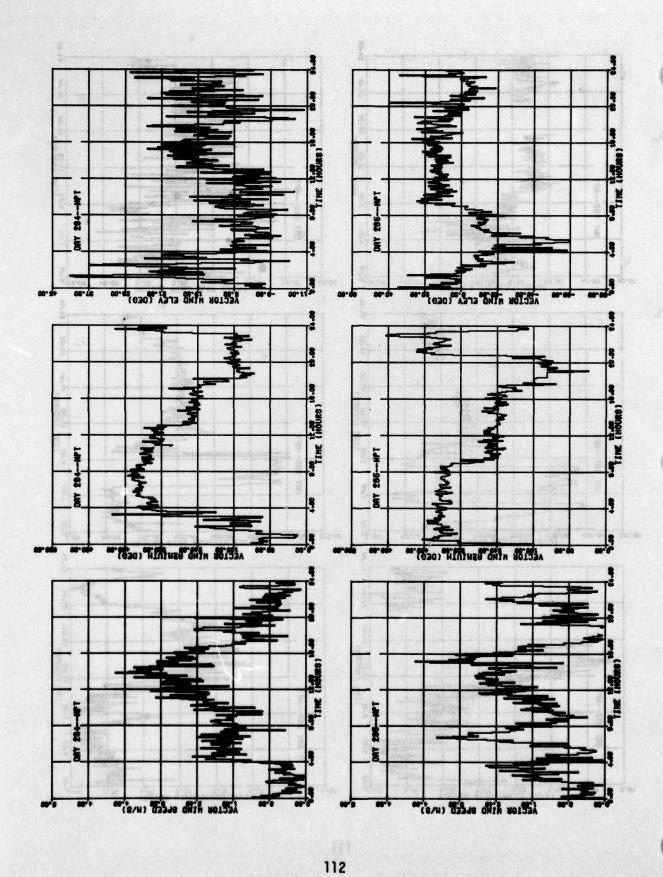


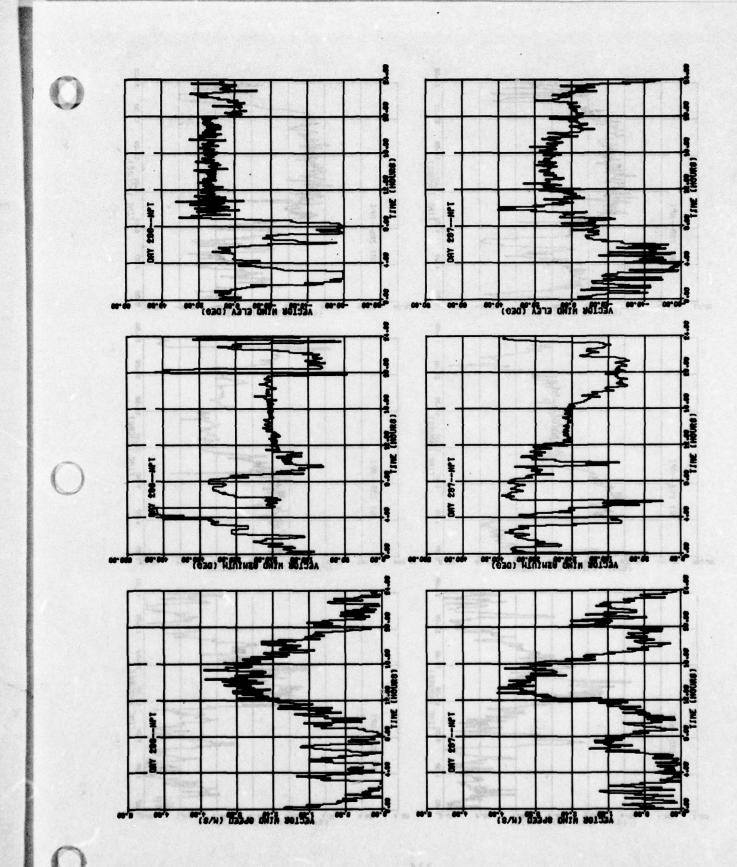


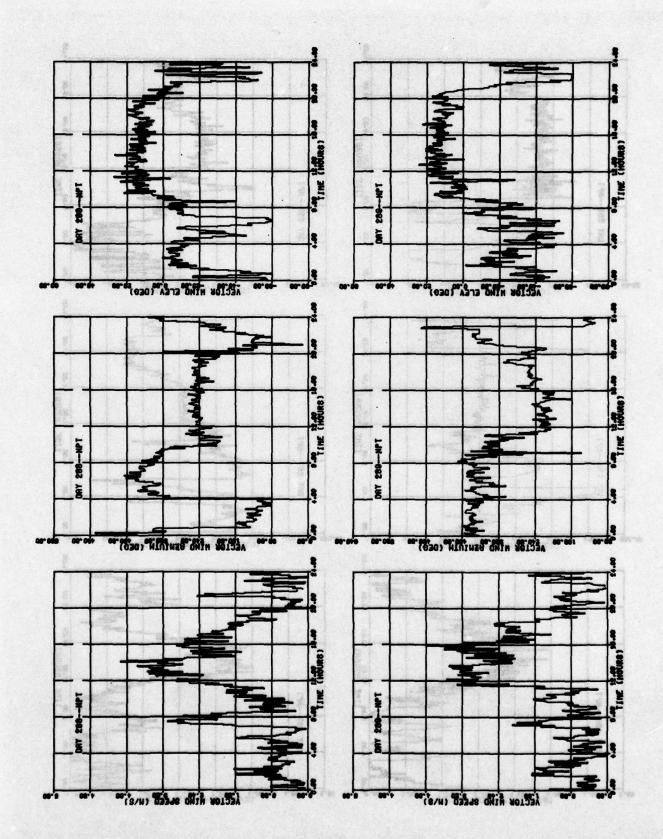


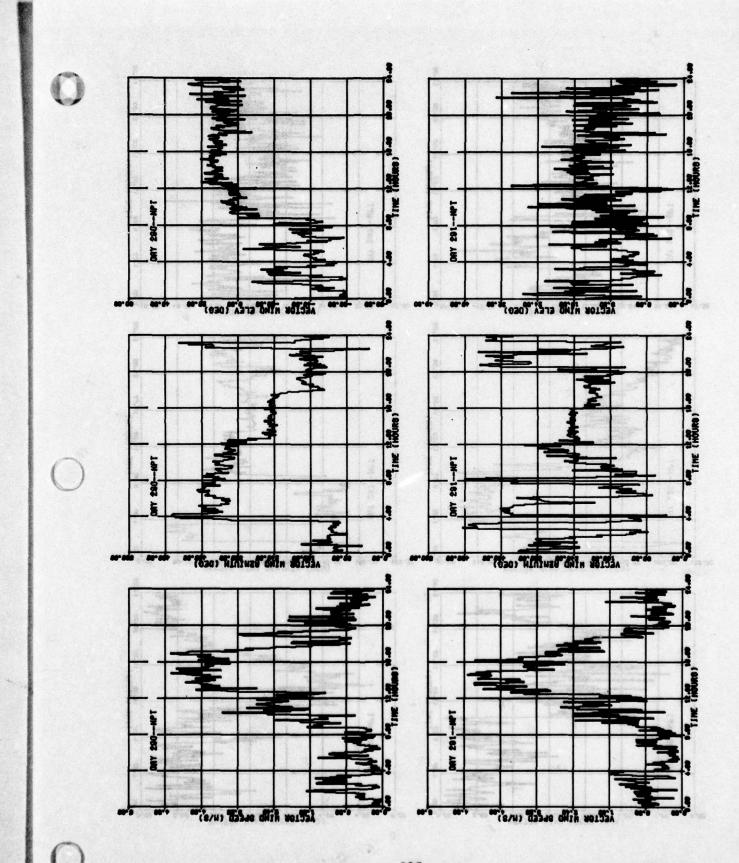


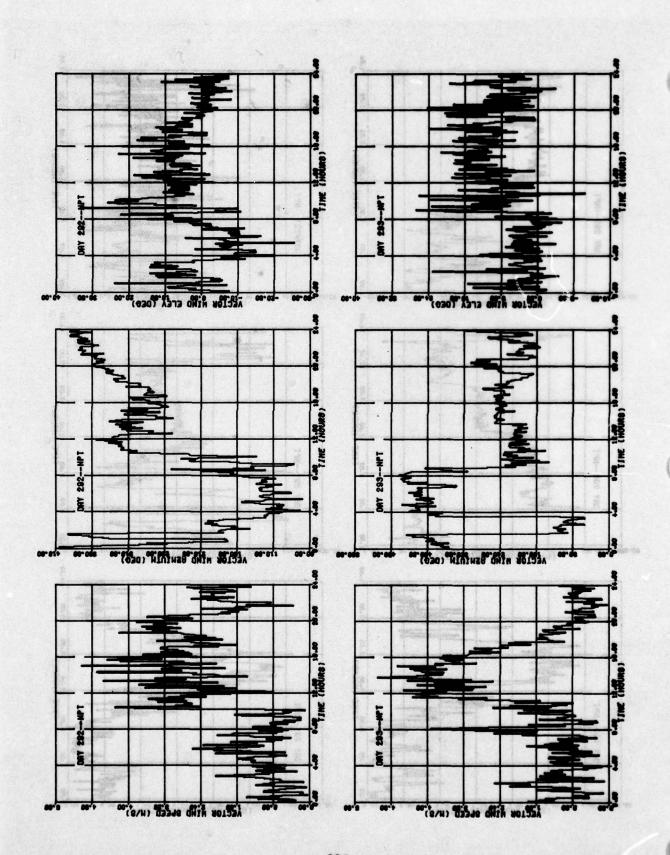


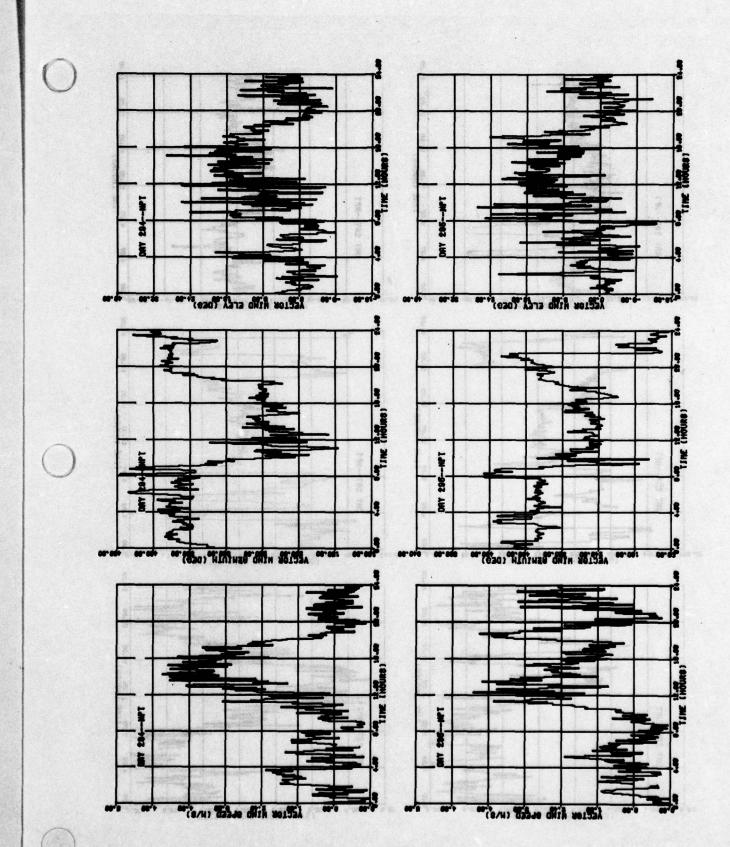


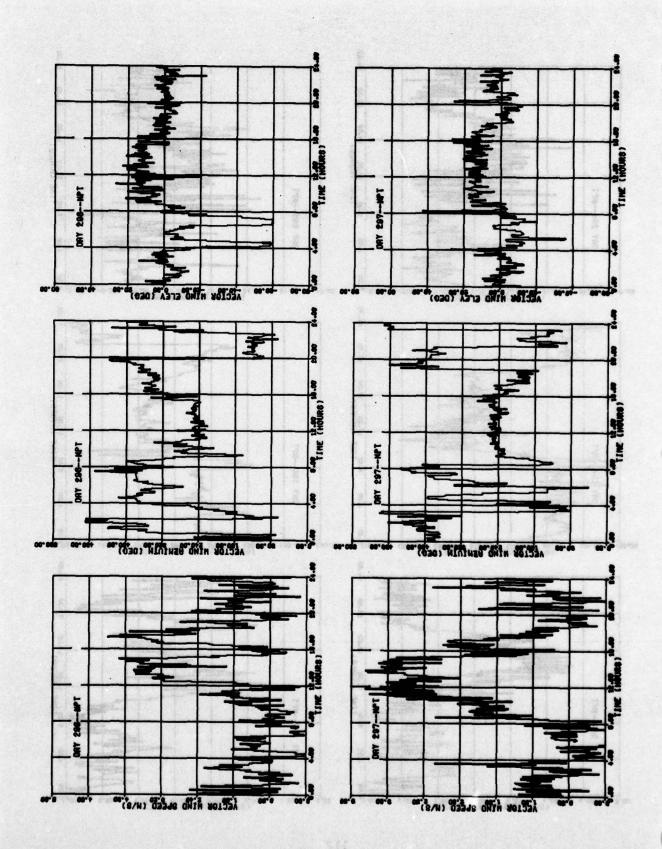


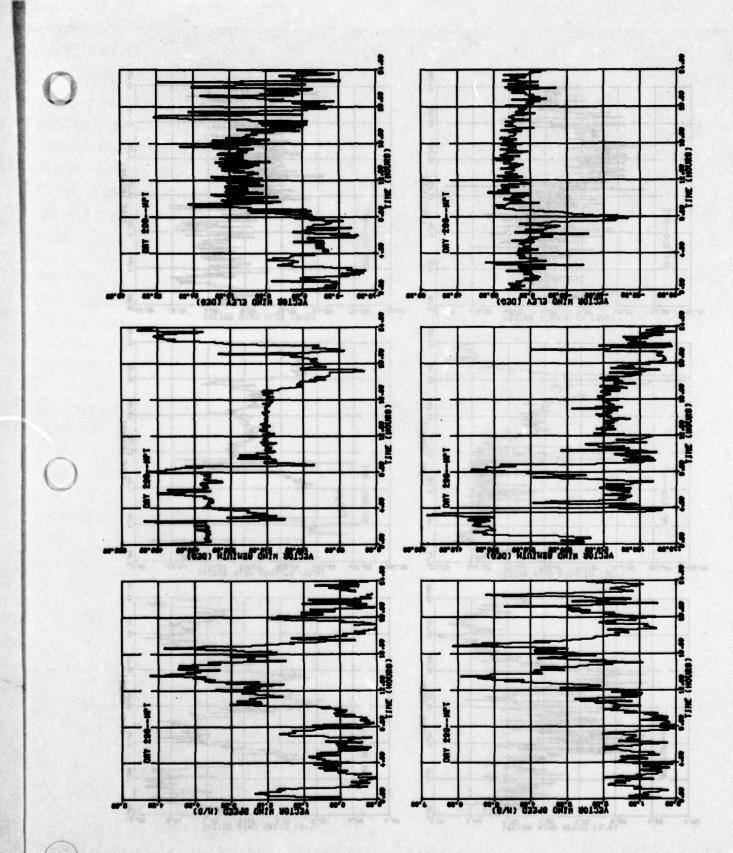


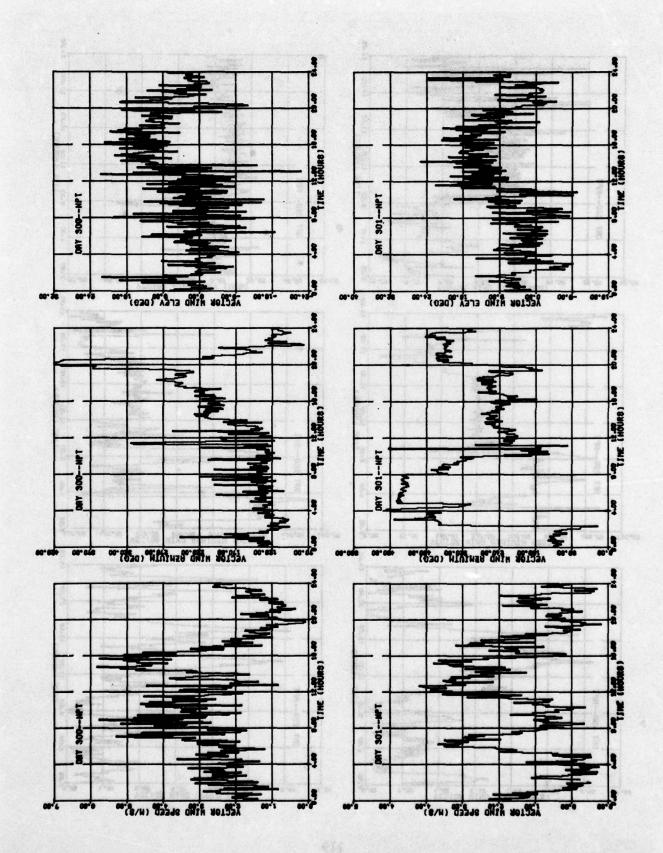


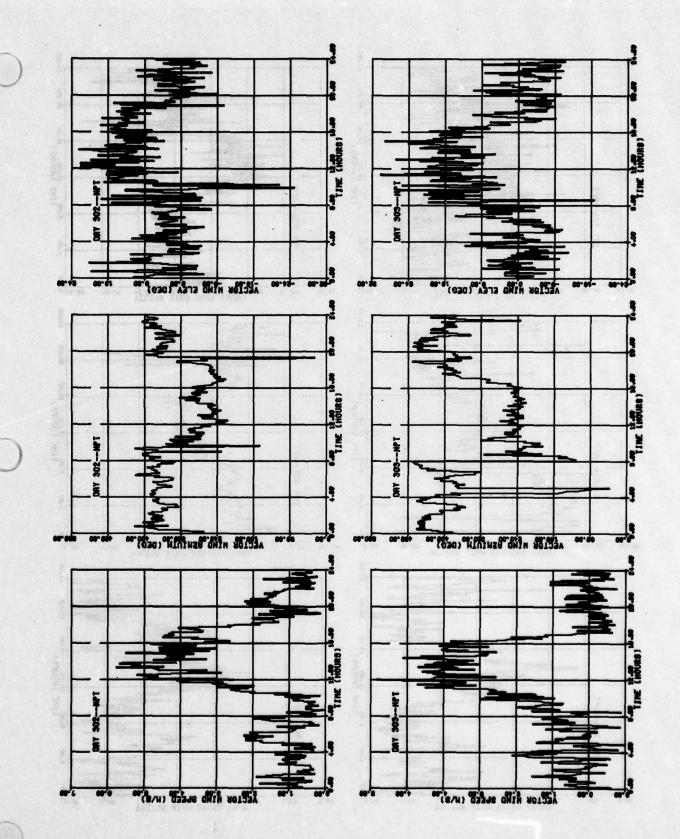


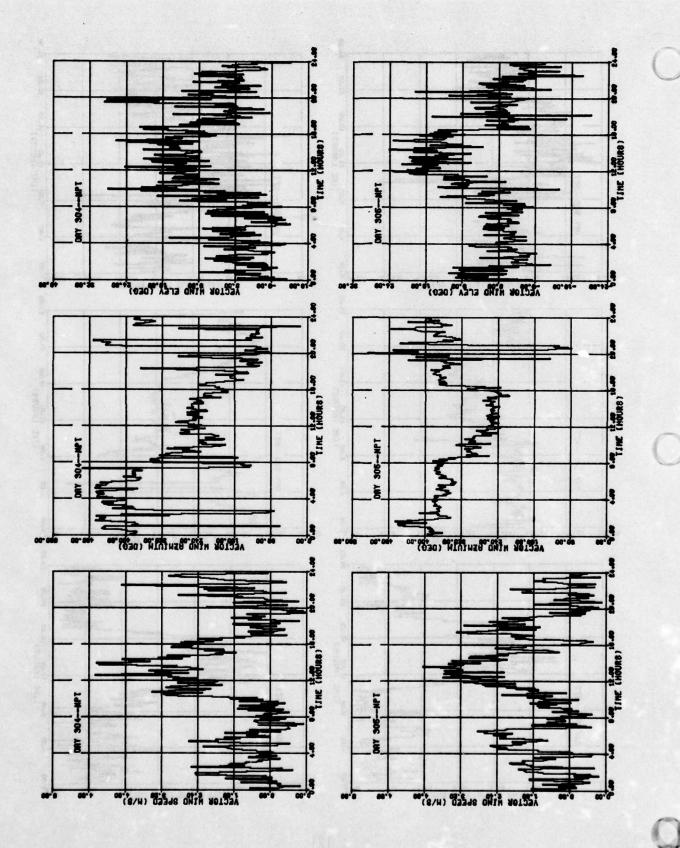


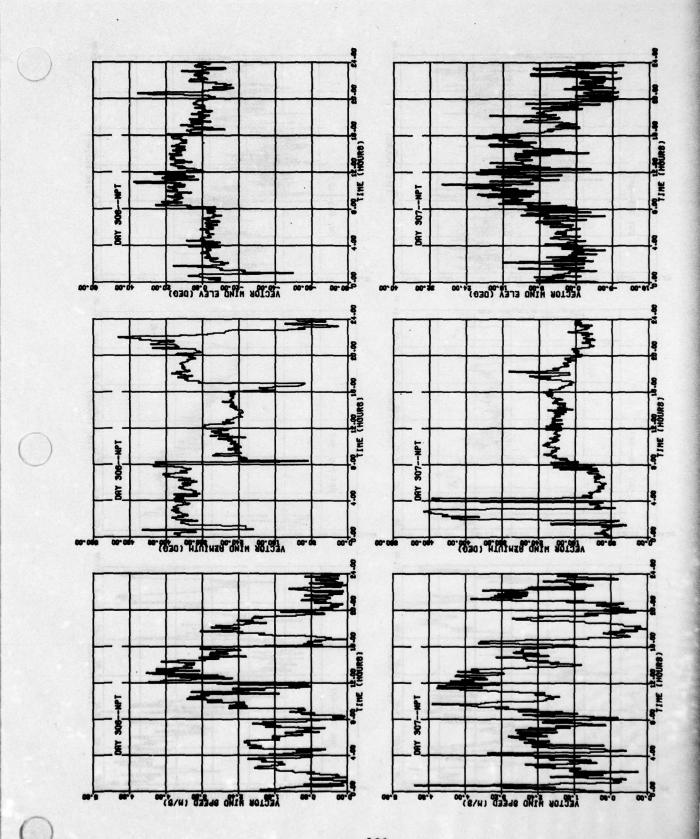


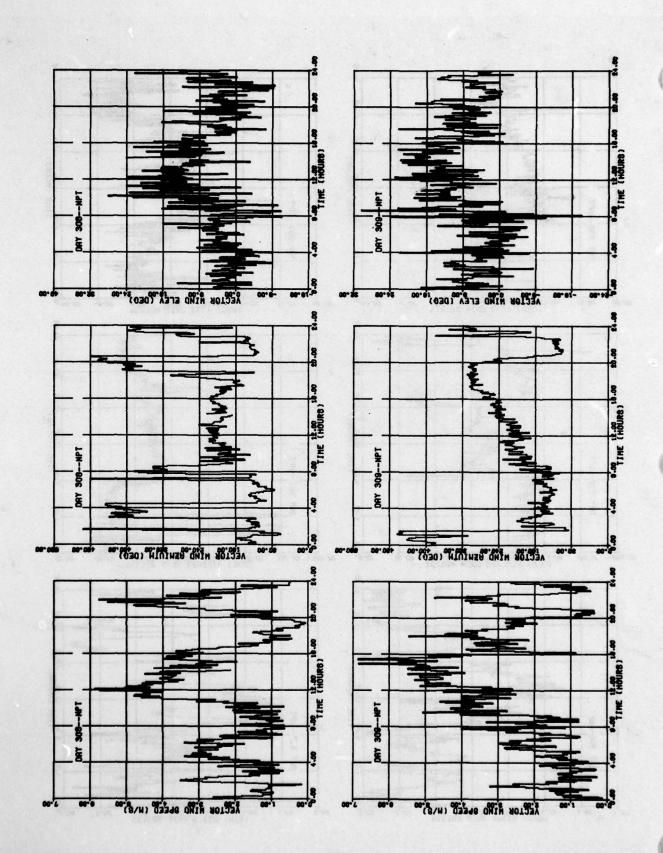


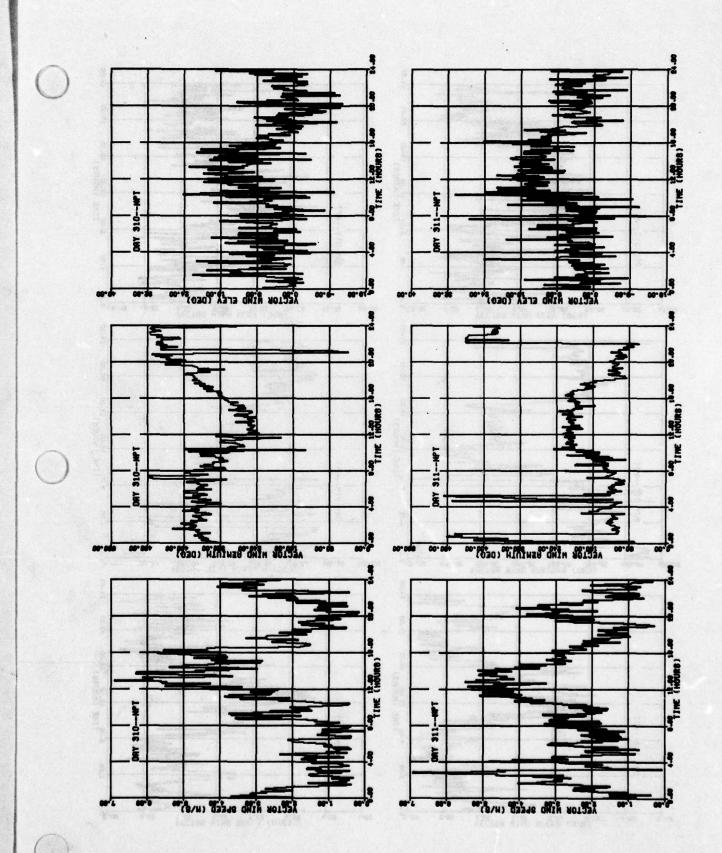


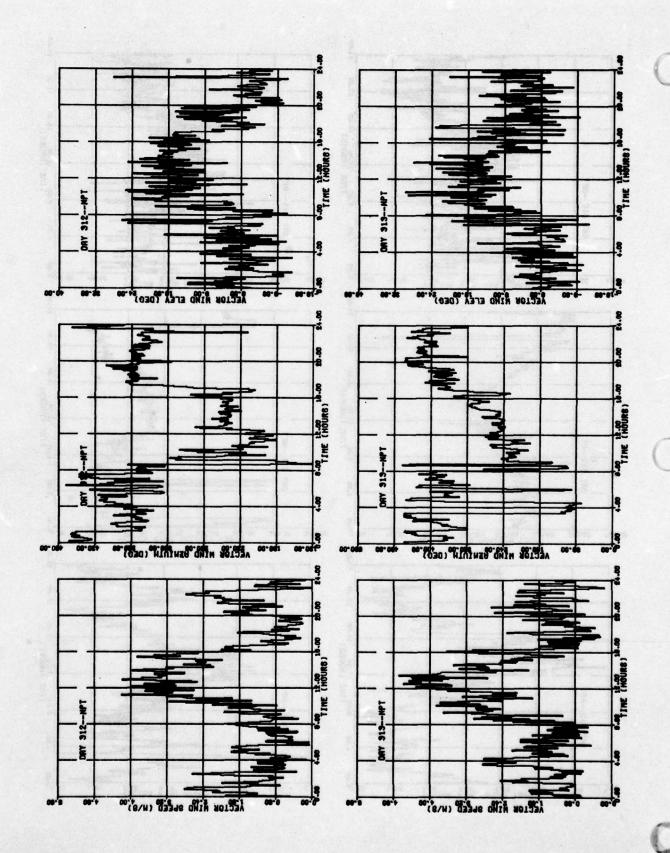


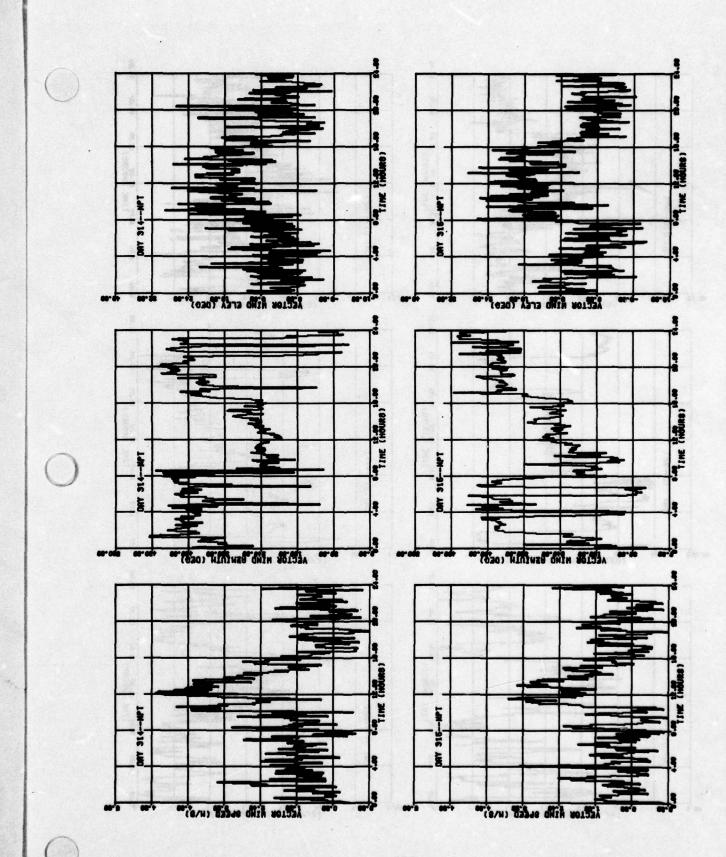


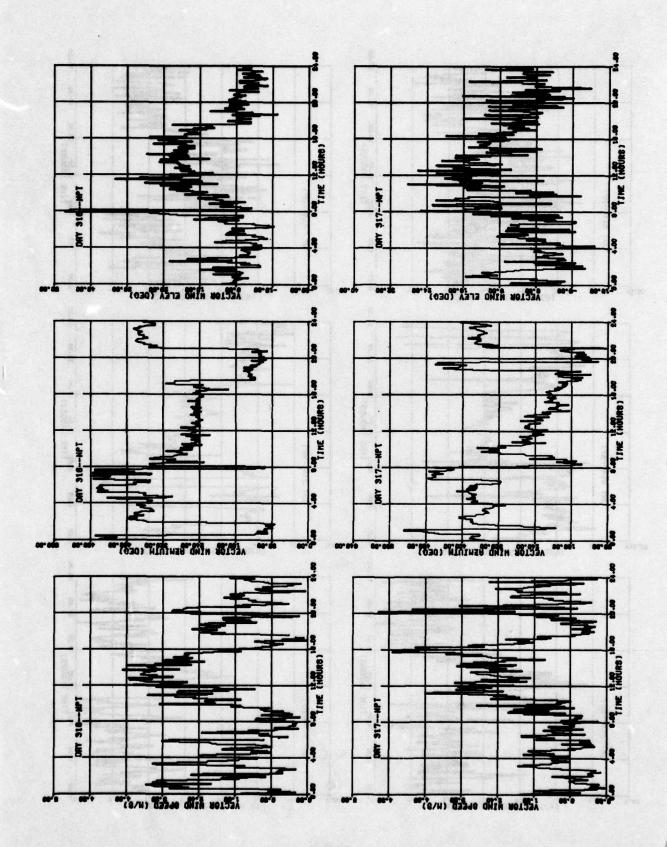


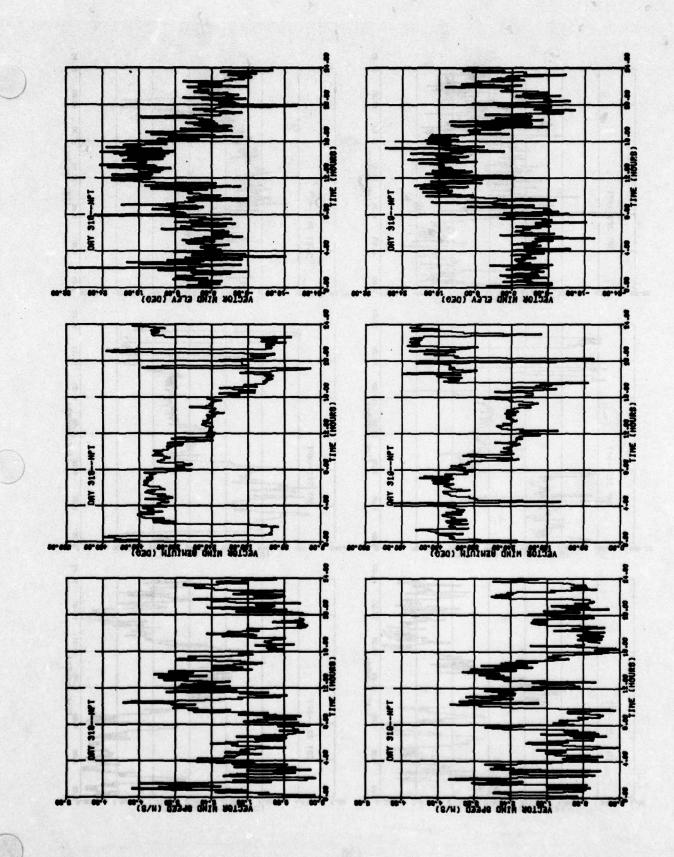


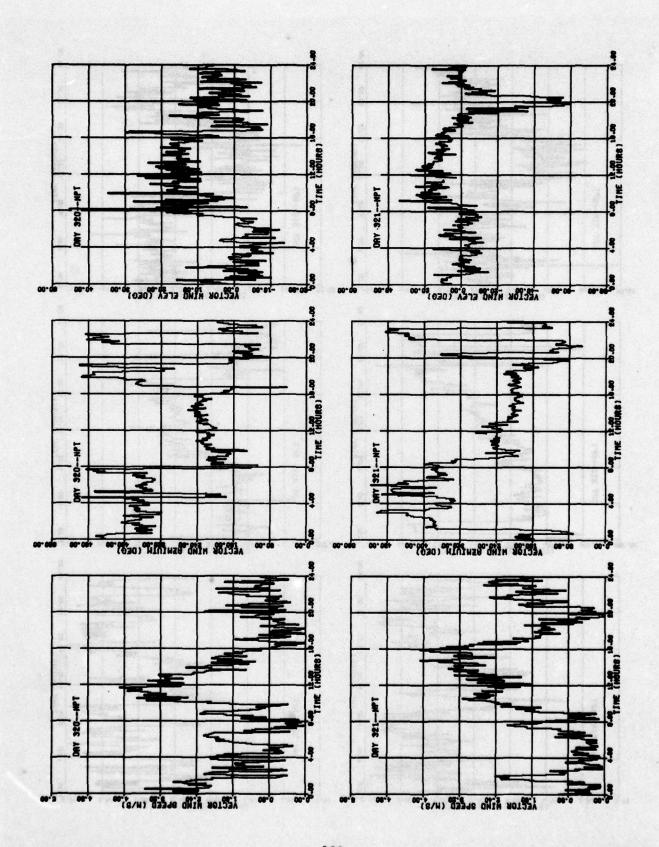


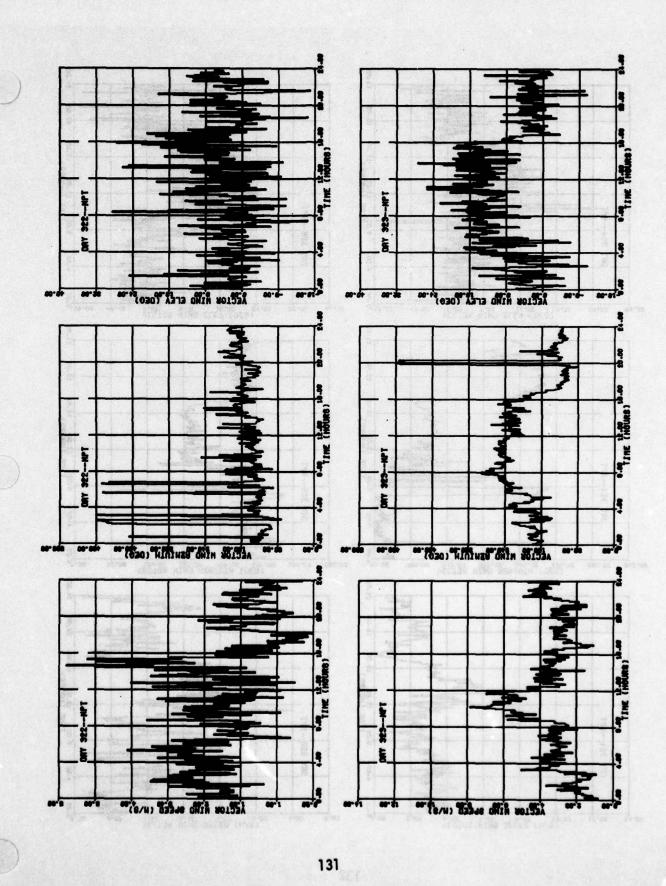


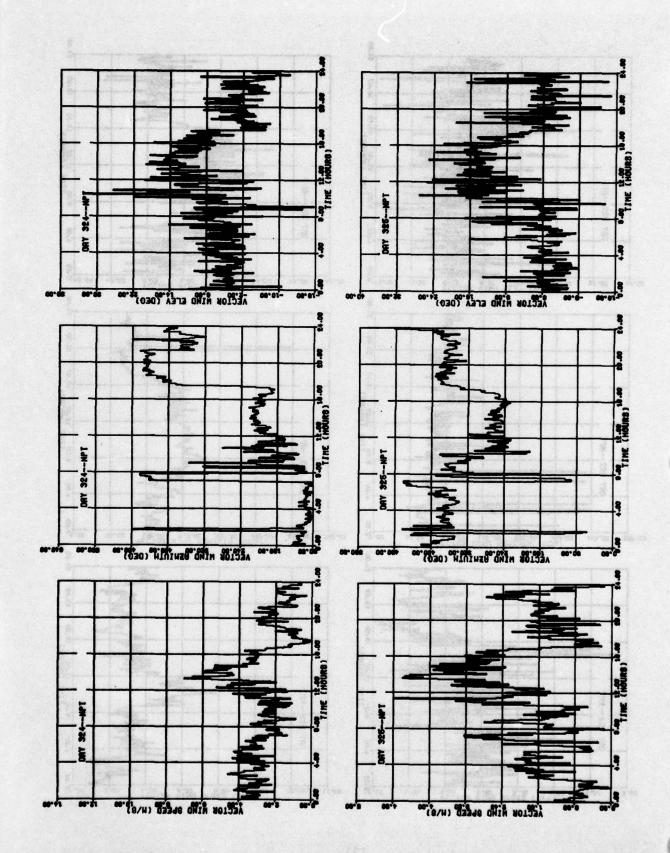


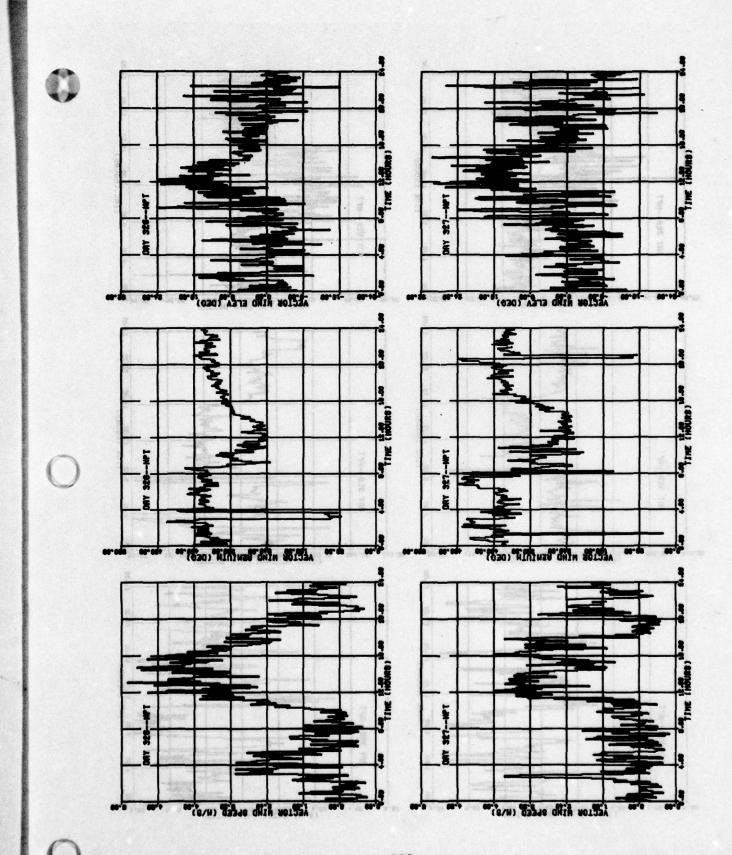


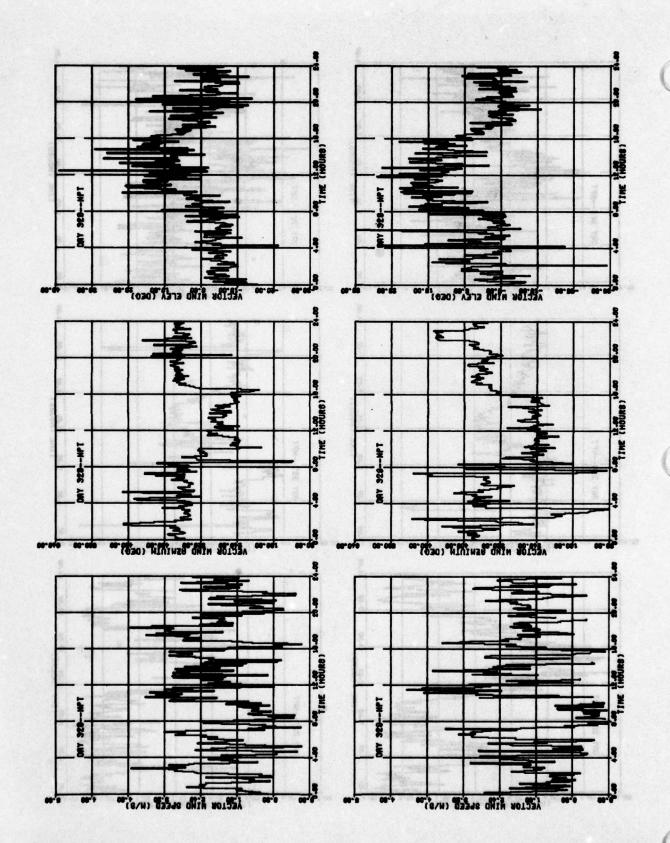


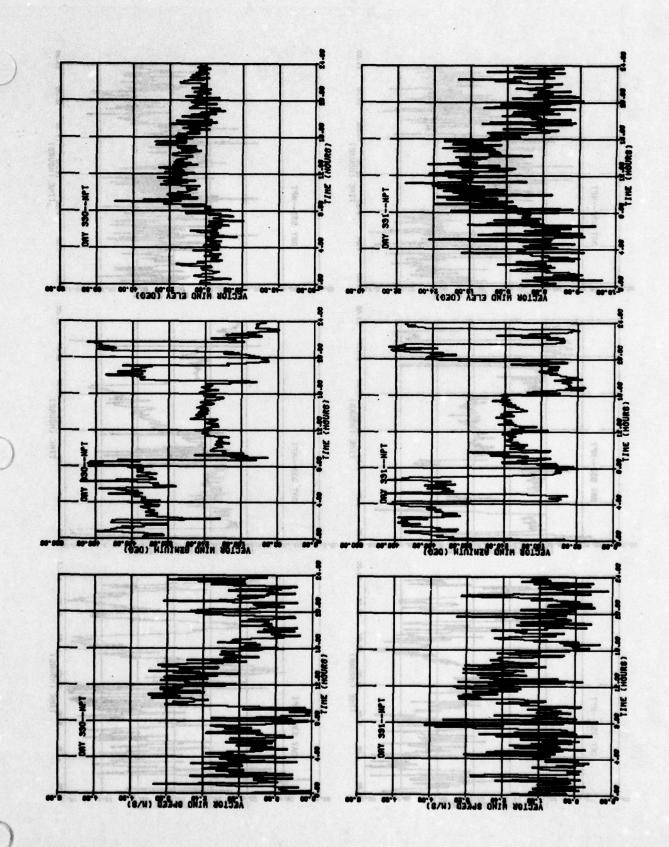


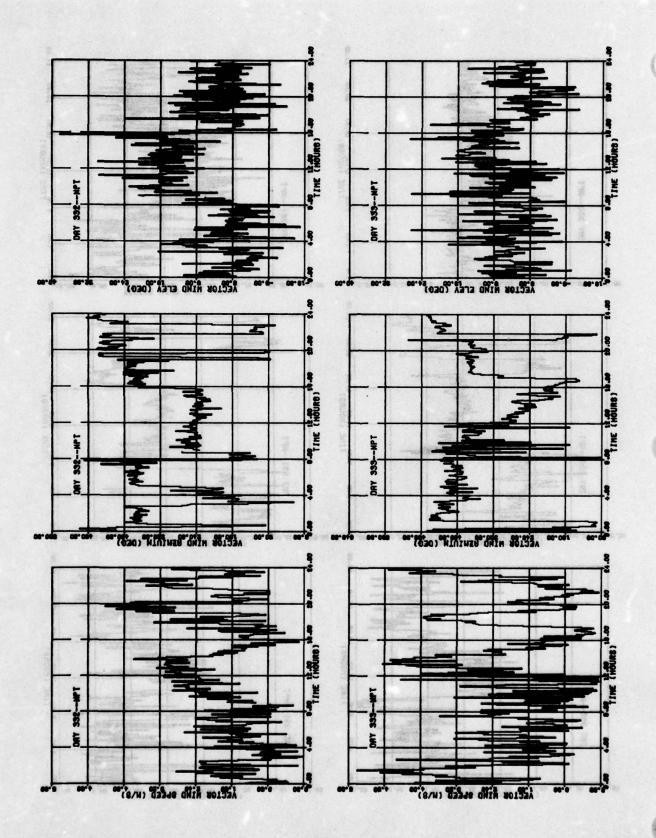


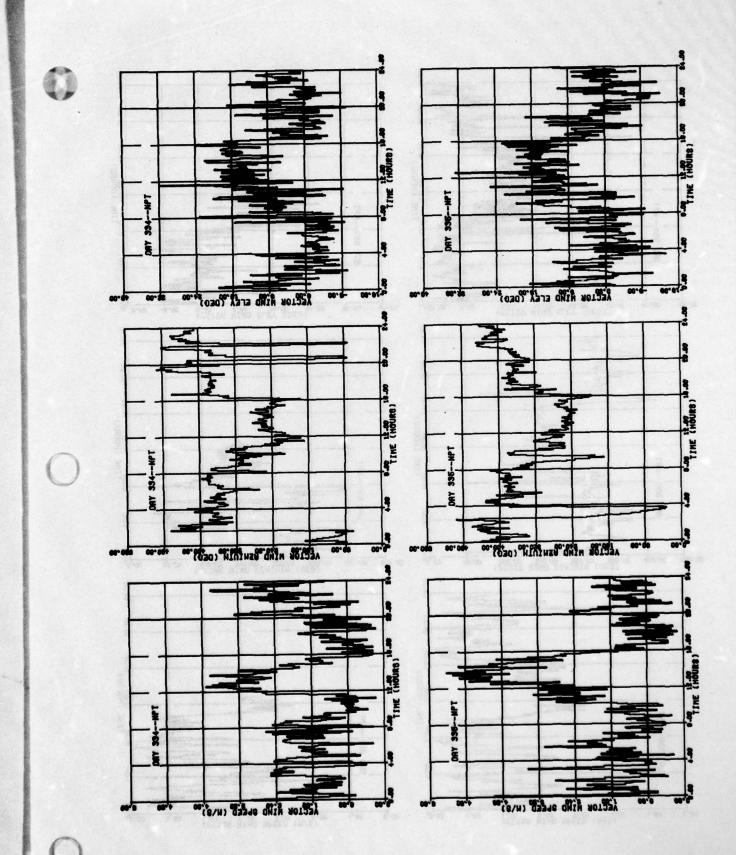


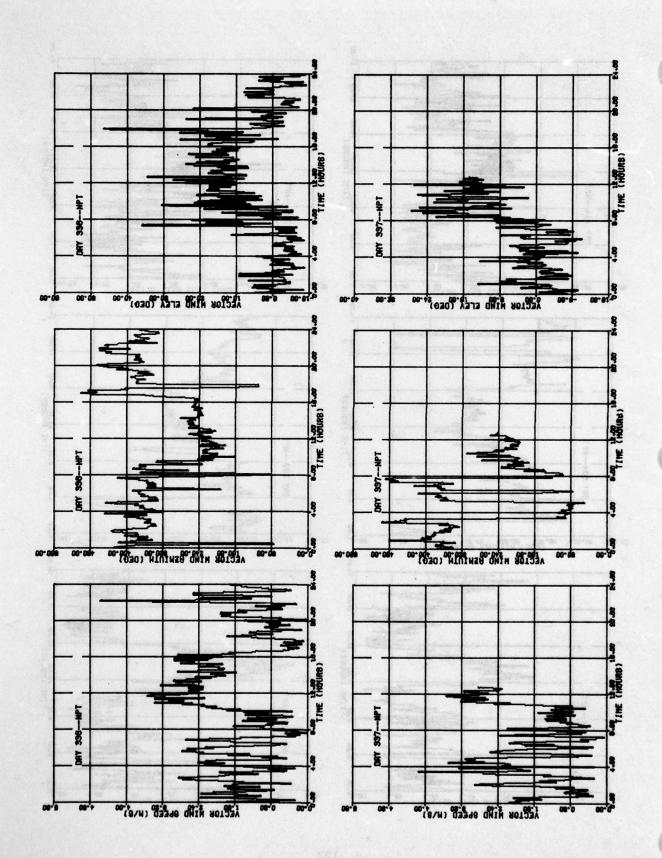


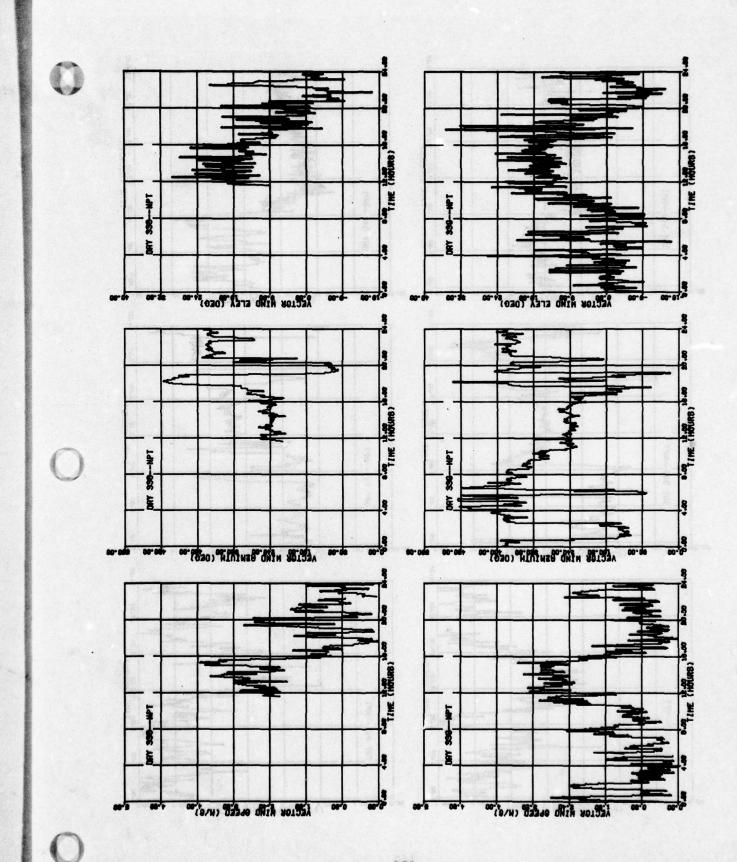


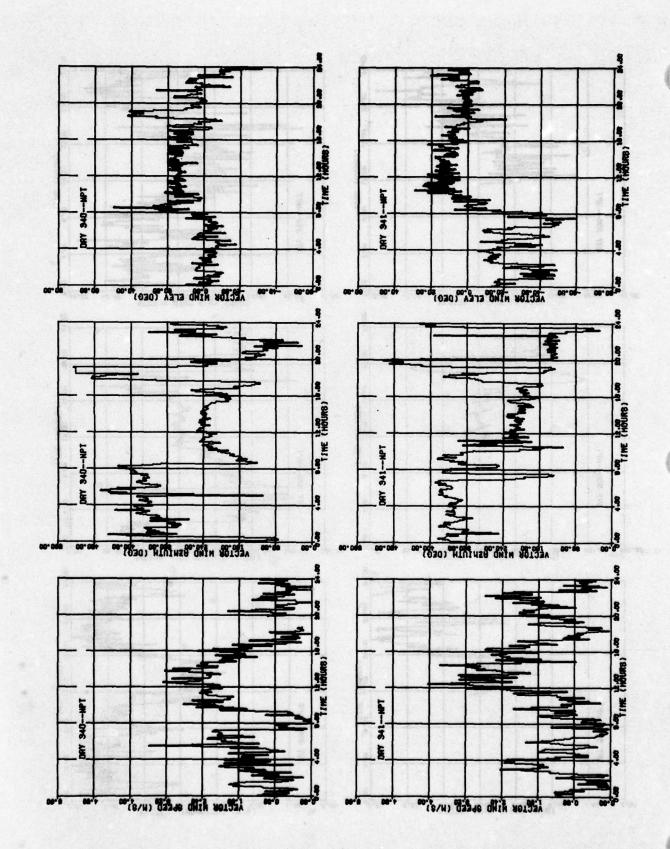


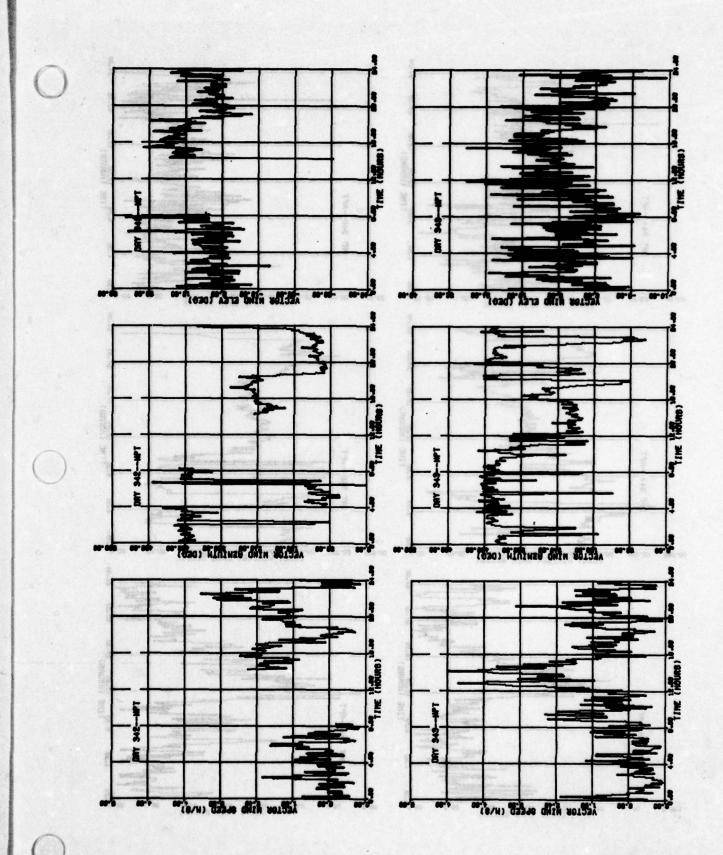


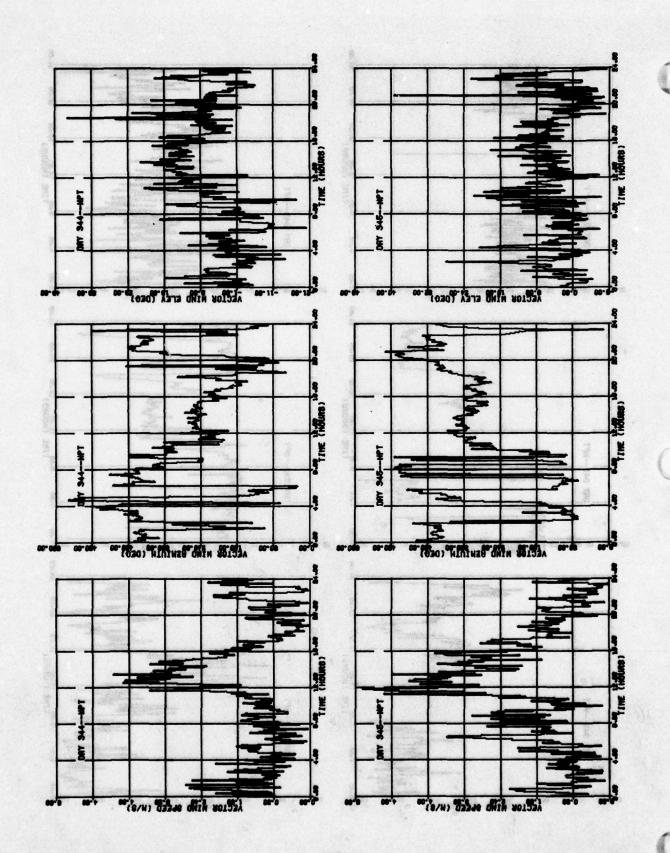


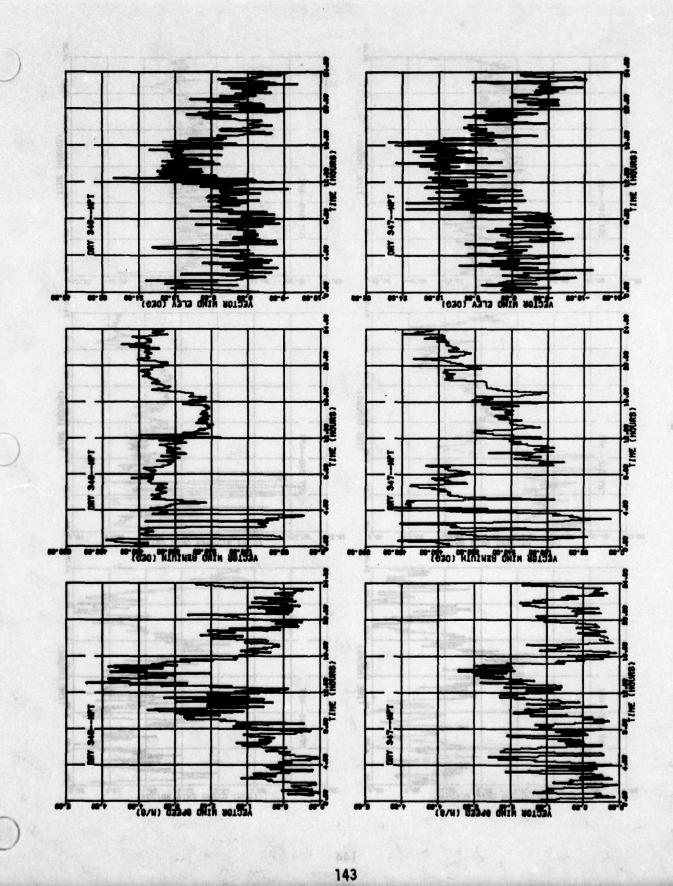


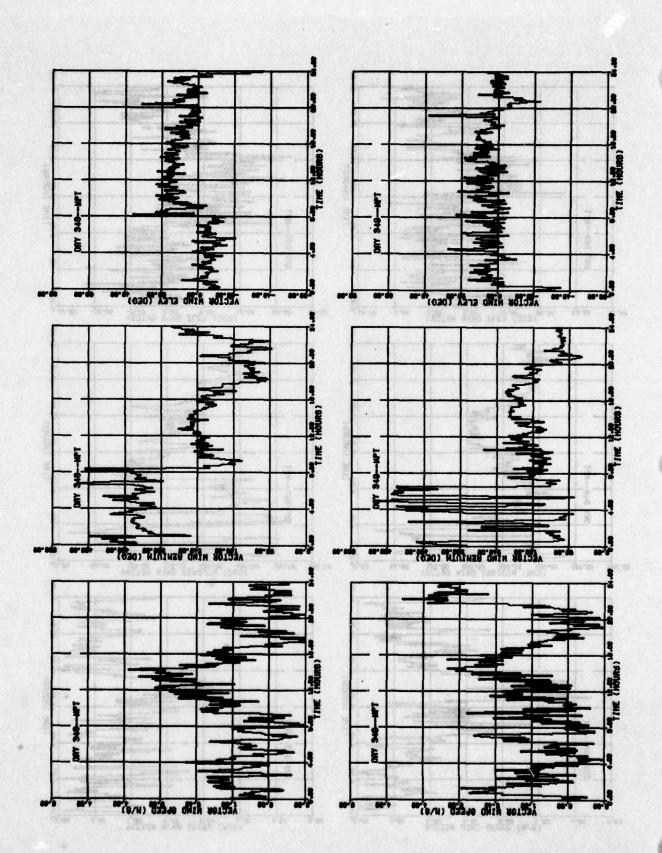


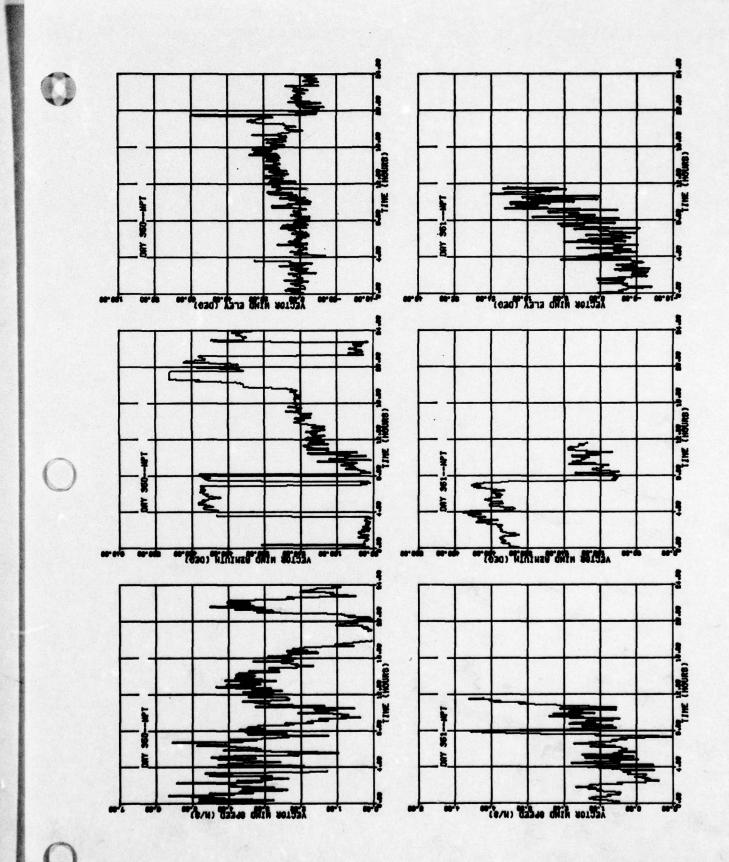












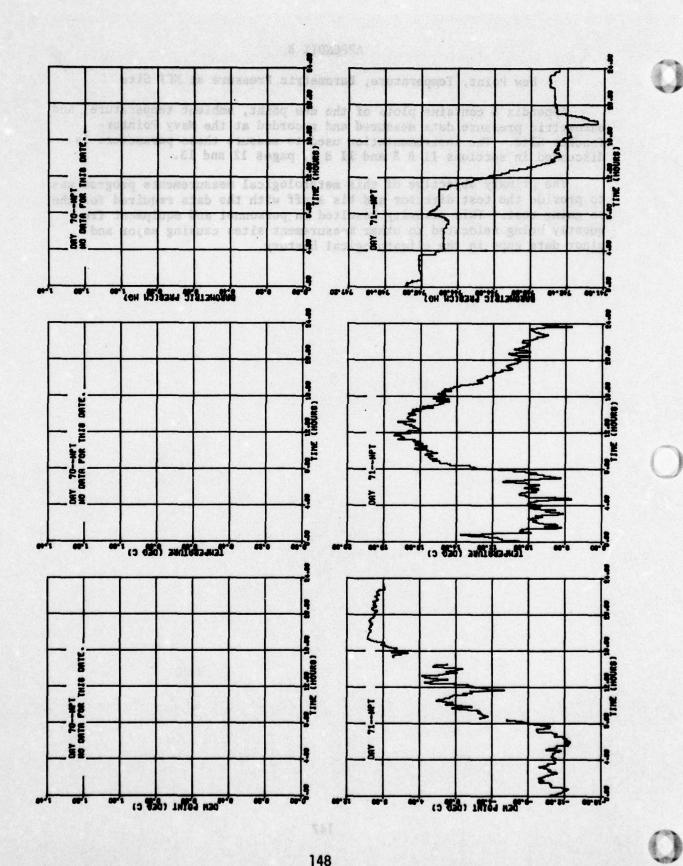
APPENDIX B

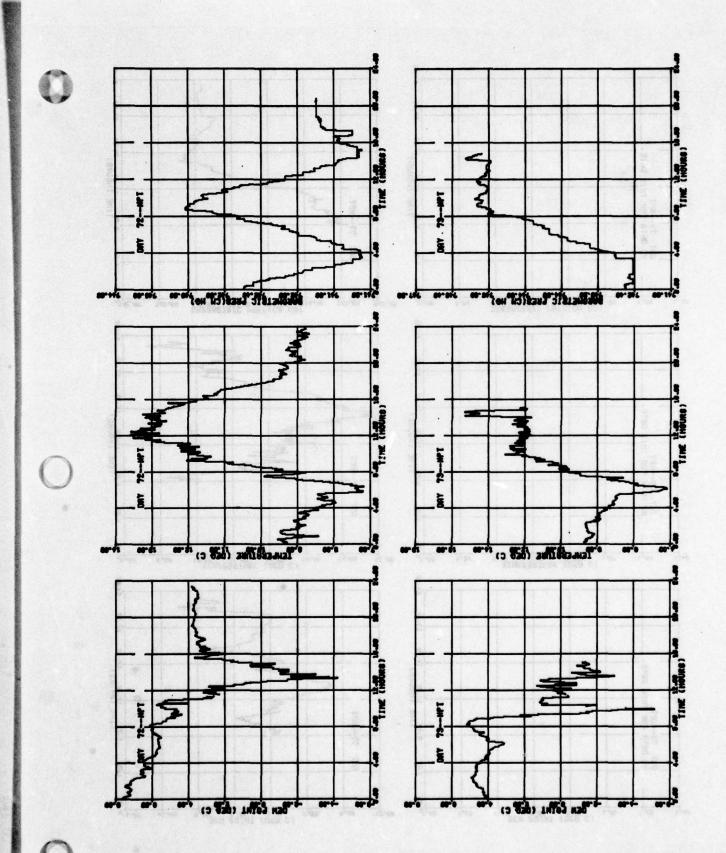
Dew Point, Temperature, Barometric Pressure at NPT Site

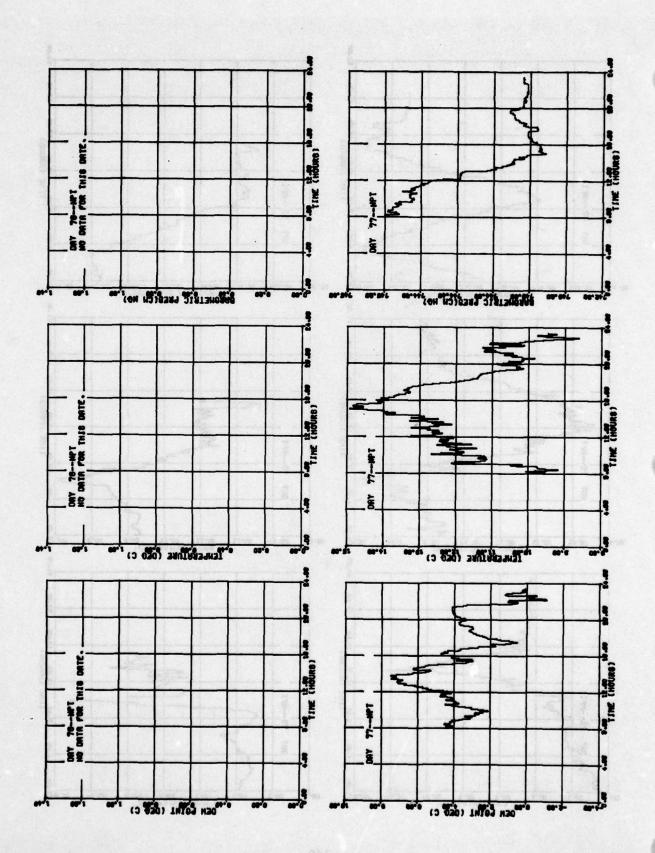
Appendix B contains plots of the dew point, ambient temperature, and barometric pressure data measured and recorded at the Navy Pointer-Tracker Site. The instrumentation used to measure these parameters is discussed in sections II B 3 and II B 4, pages 12 and 13.

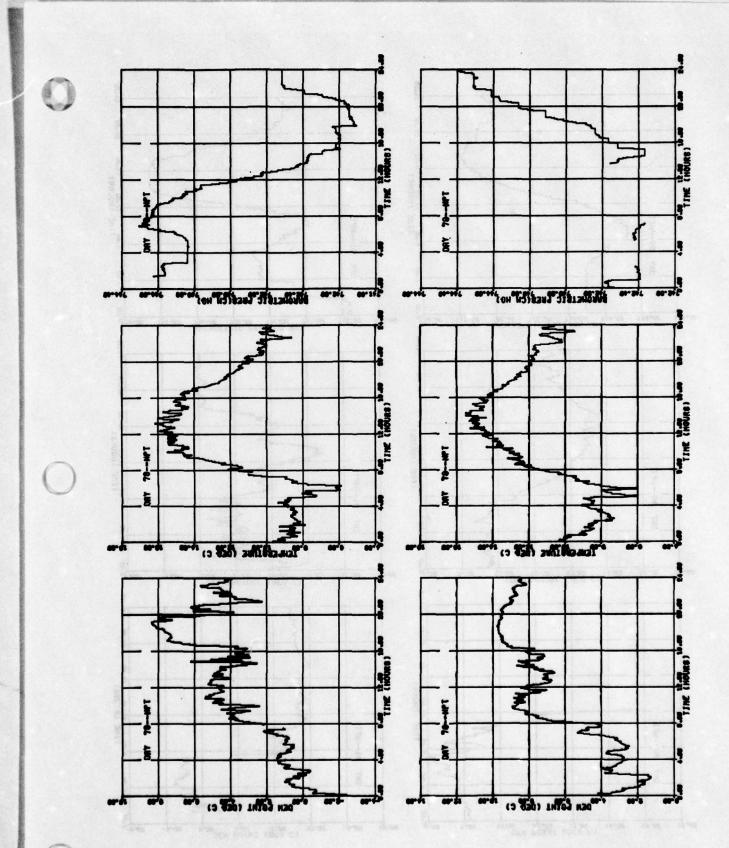
The primary objective of this meterological measurements program was to provide the test director and his staff with the data required for the on going test. This priority resulted in personnel and equipment frequently being relocated to other measurement sites causing major and minor data gaps in the climatological history.

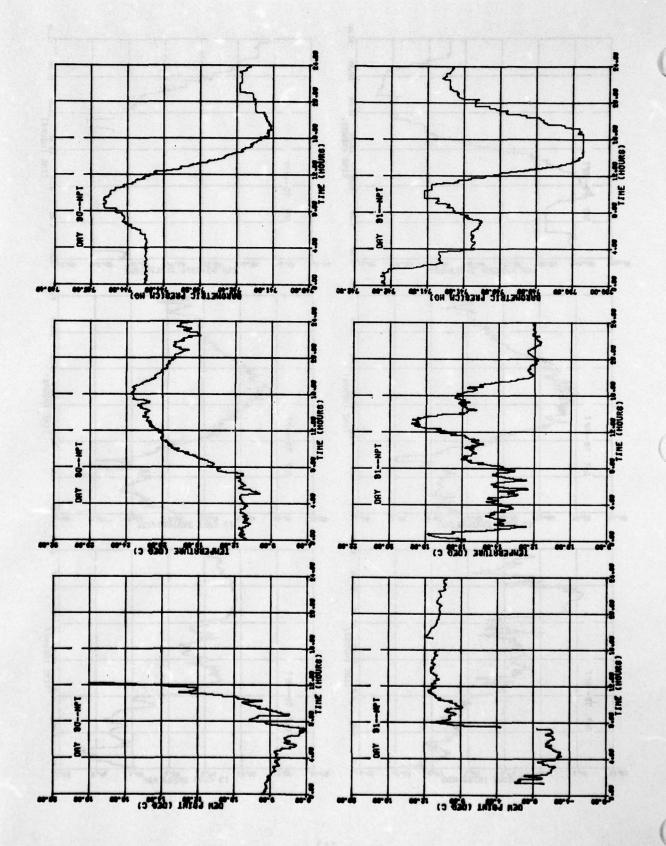
Maddle After

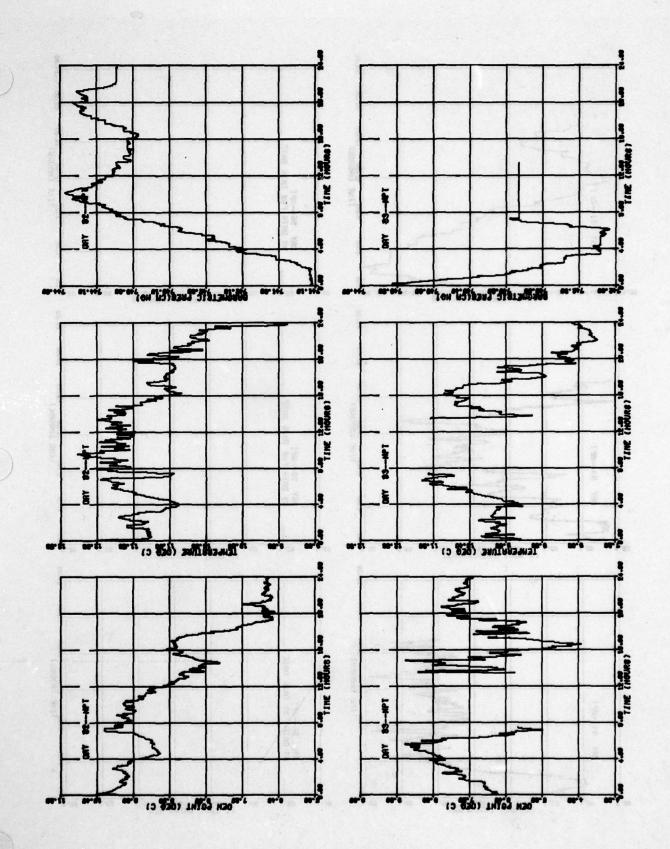


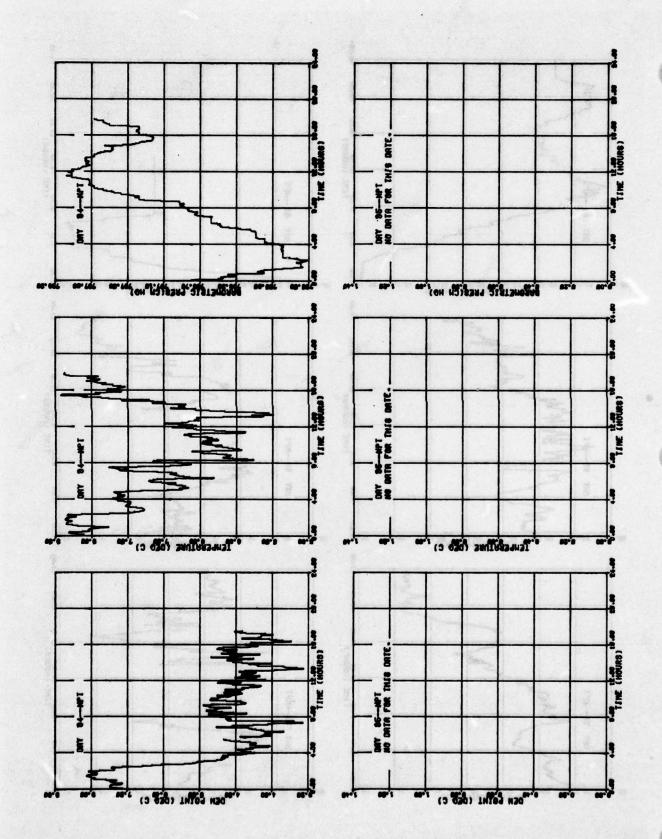


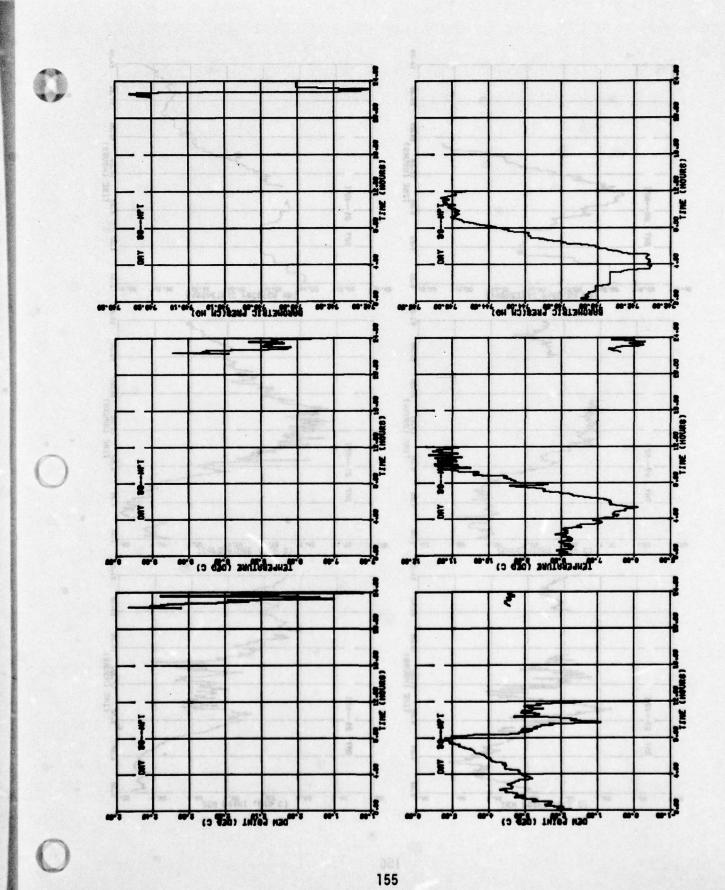


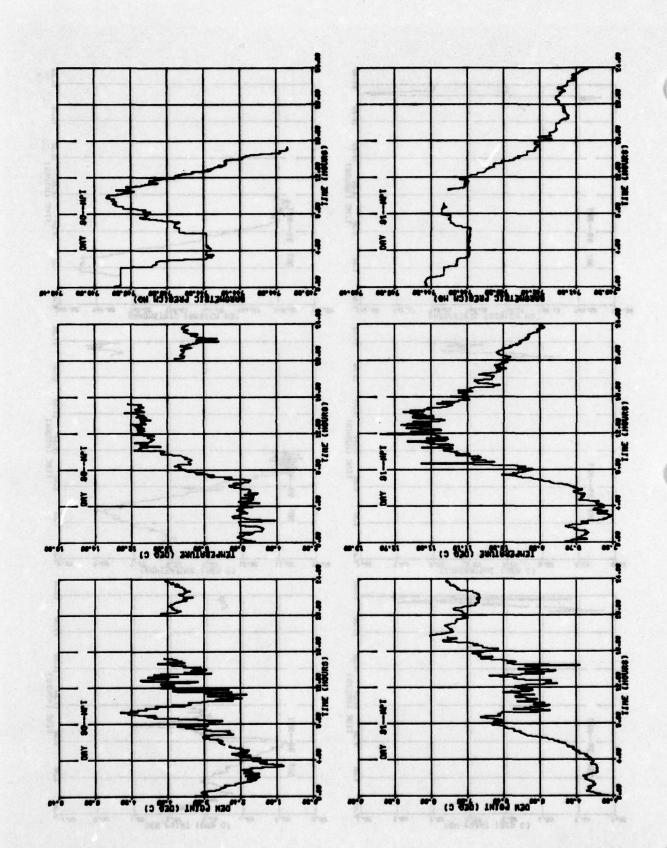


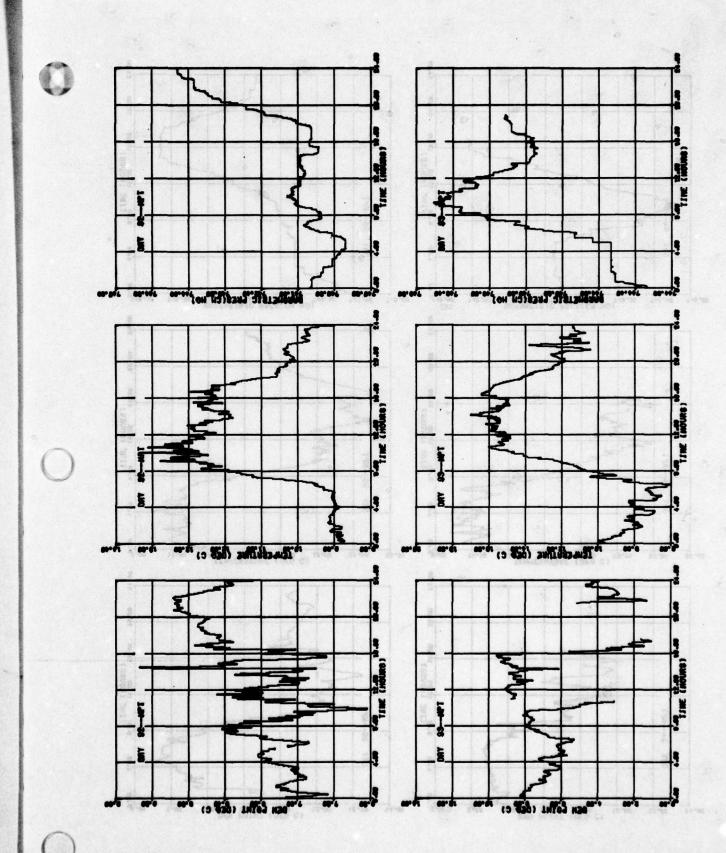


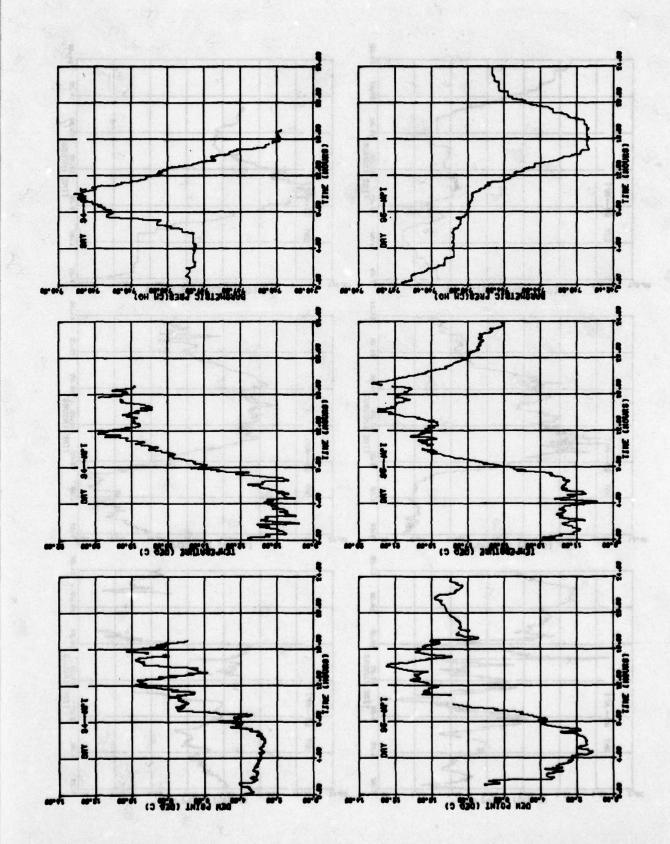


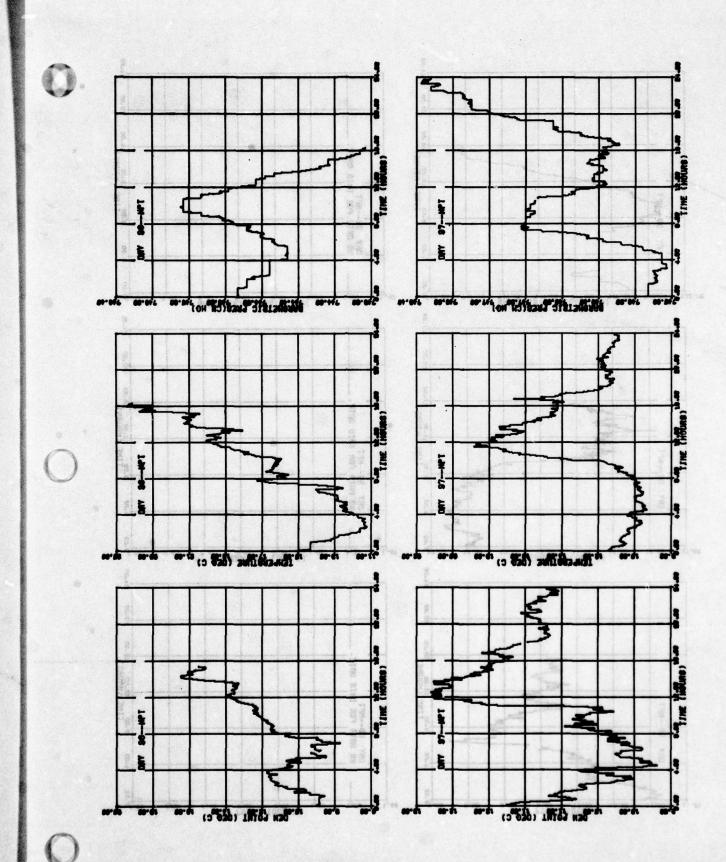


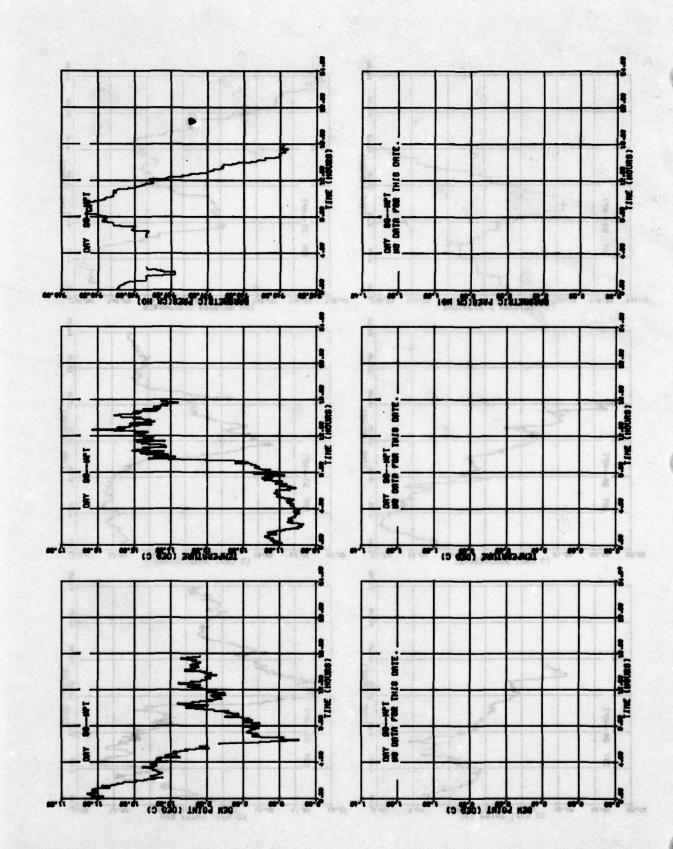


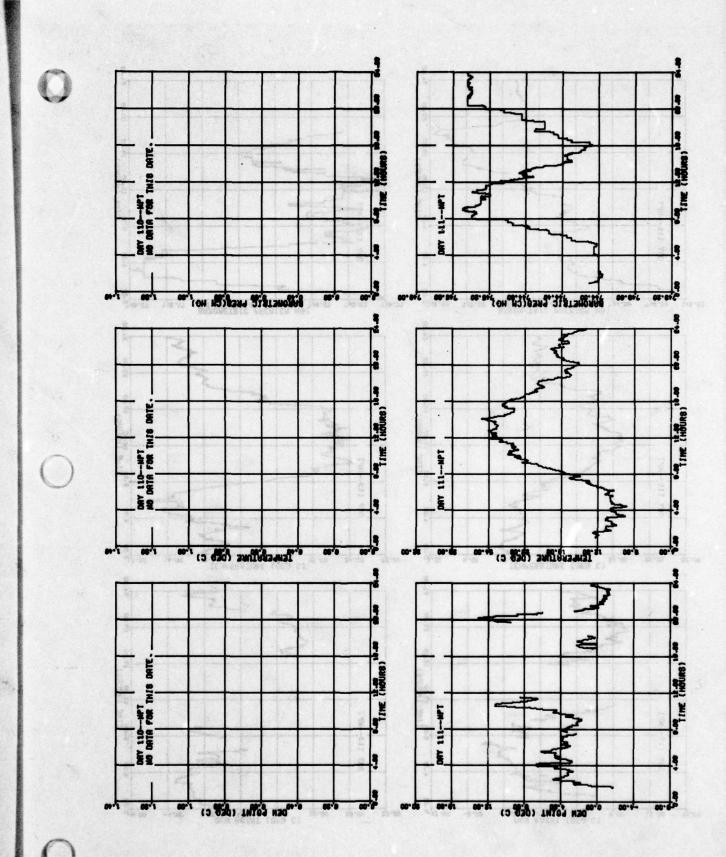


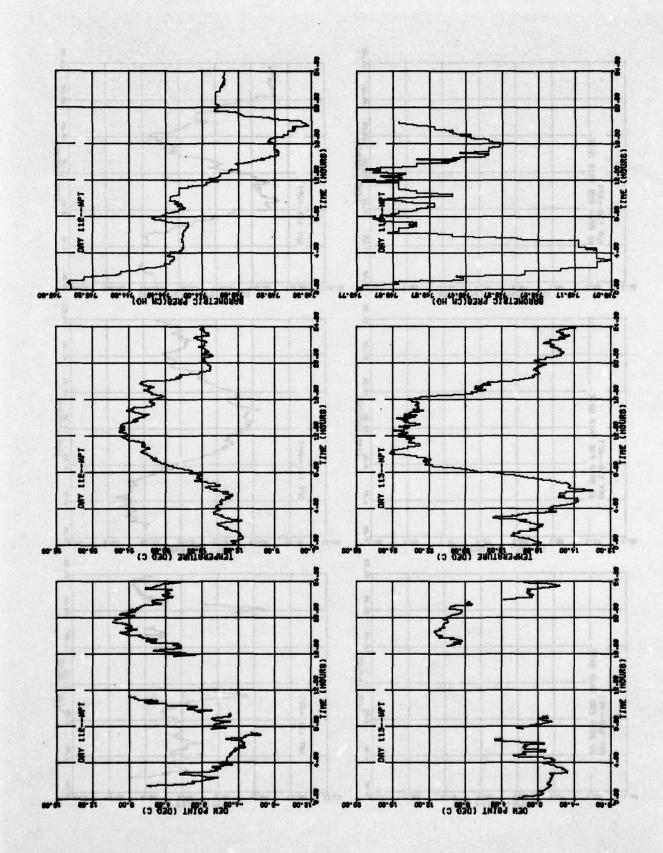


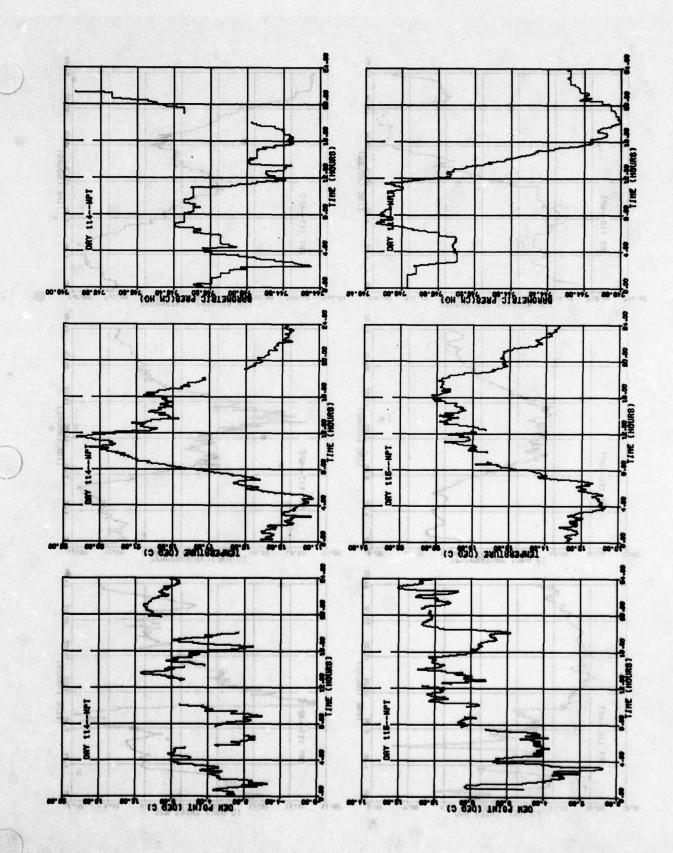


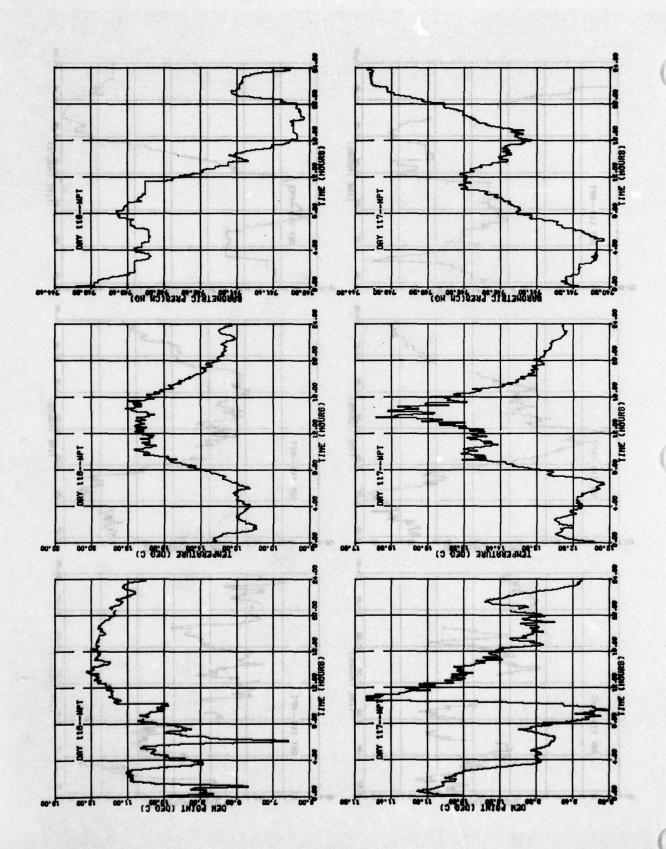


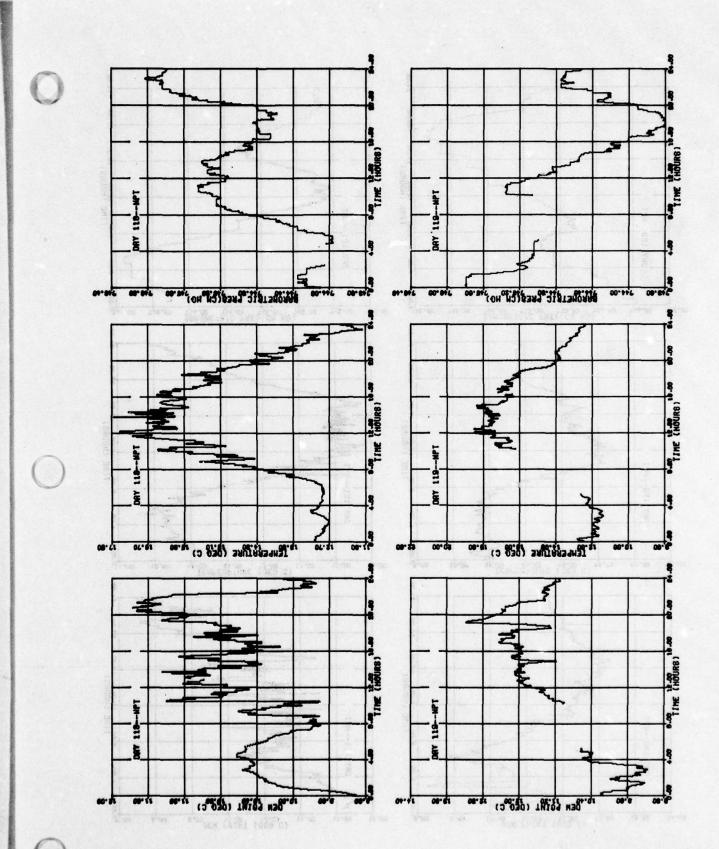


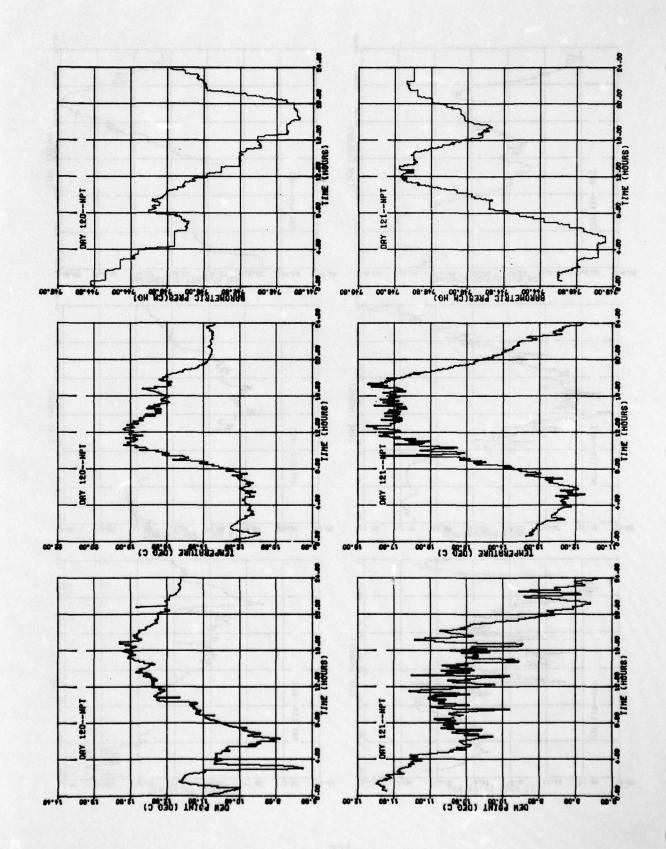


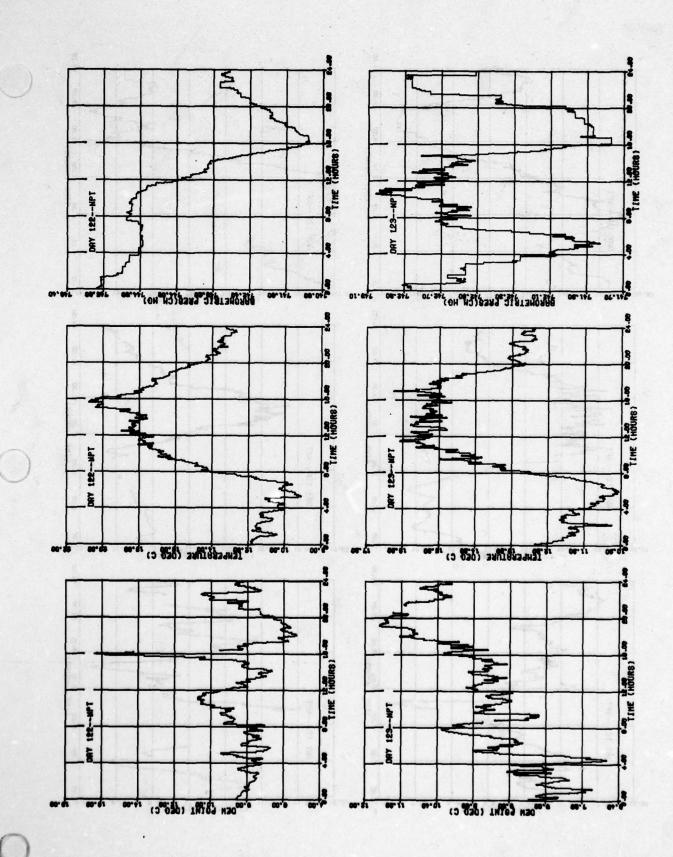


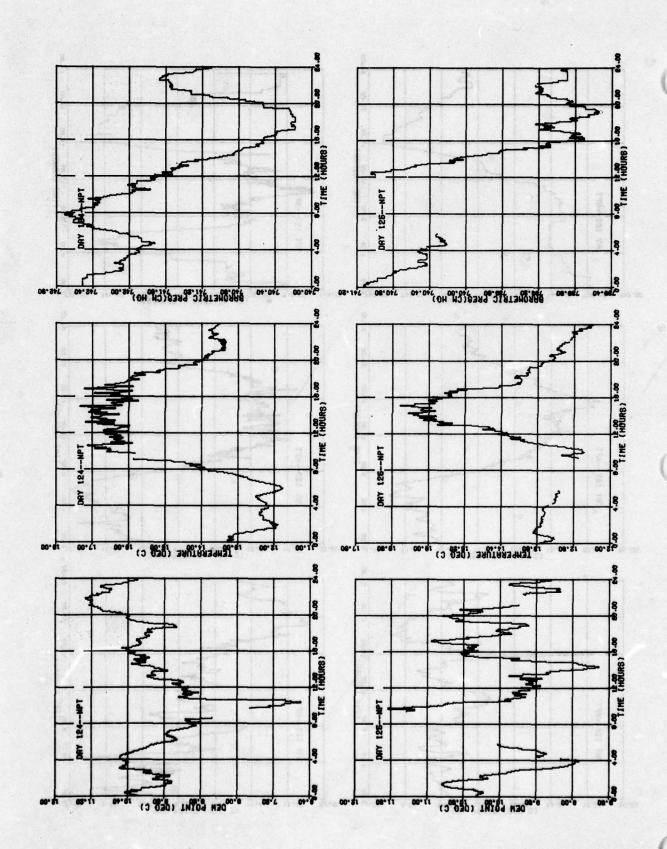


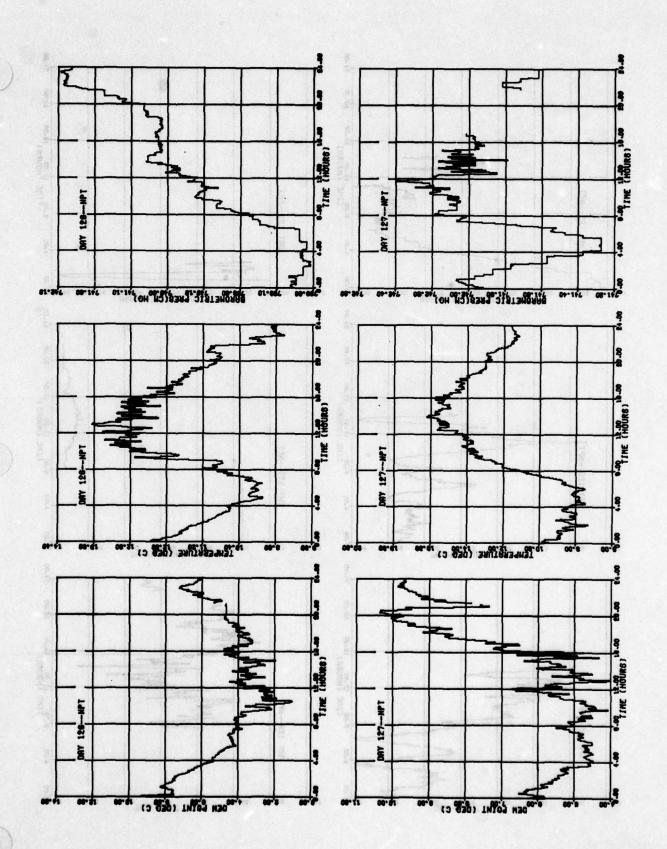


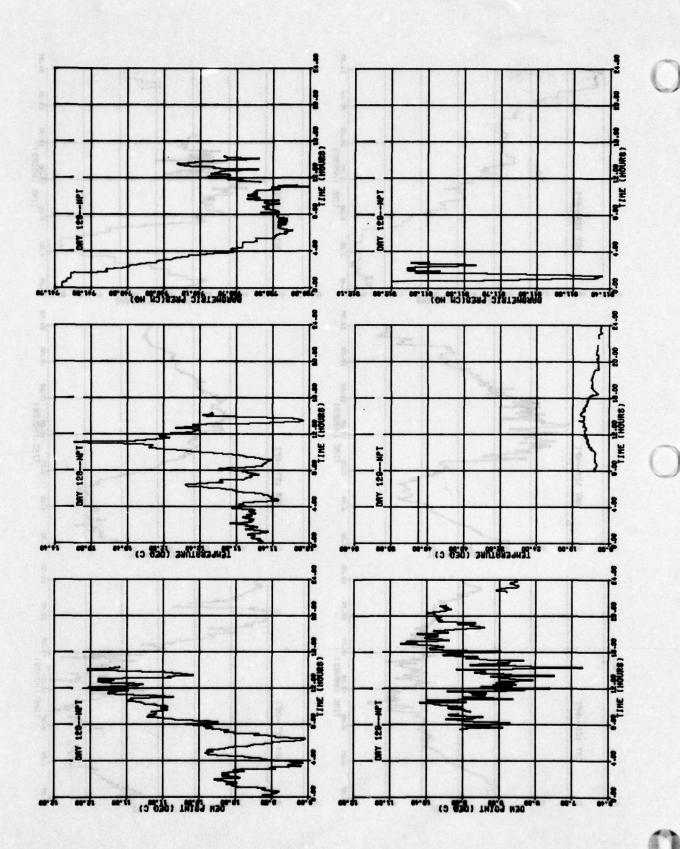


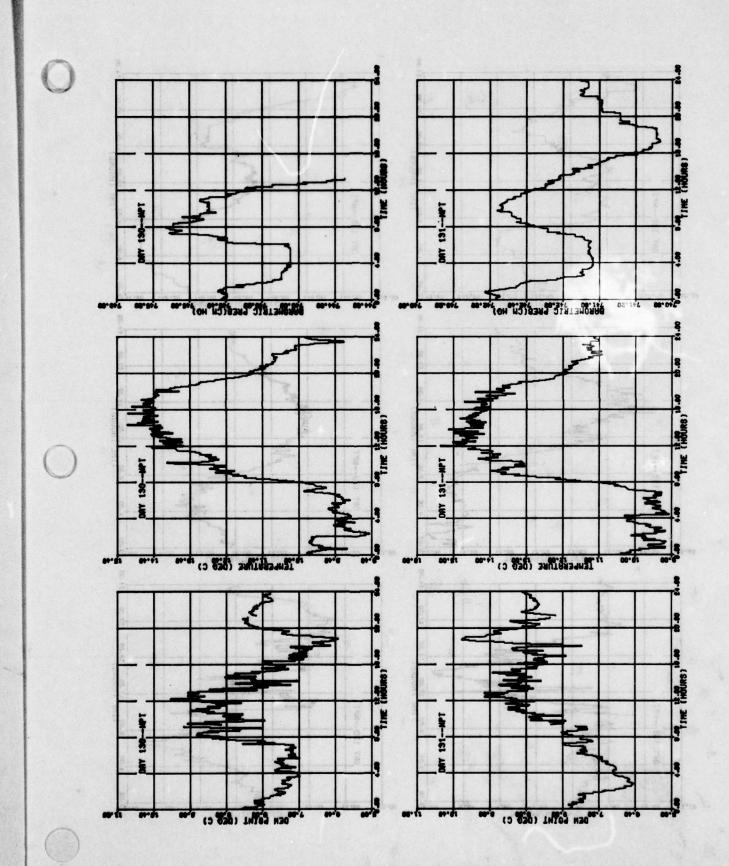


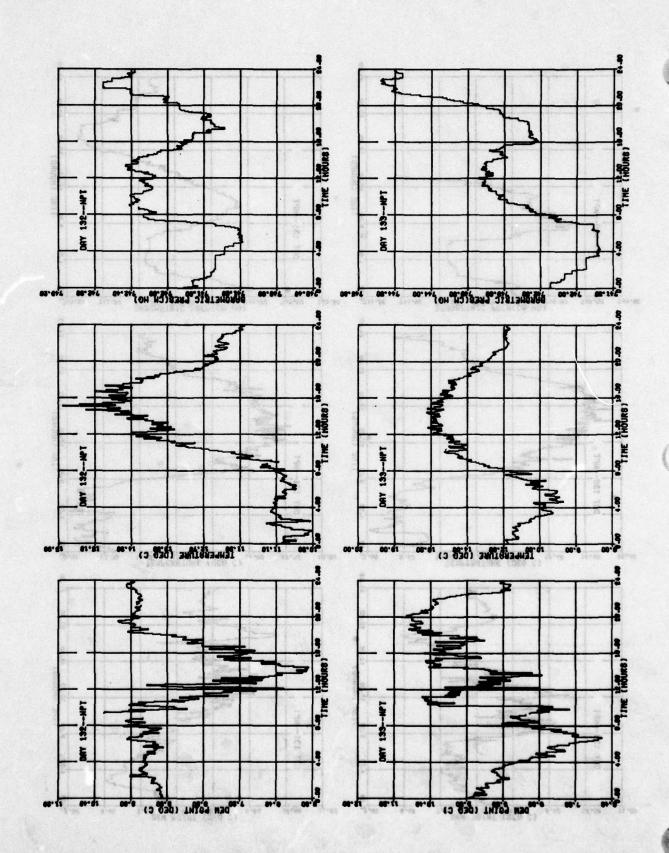


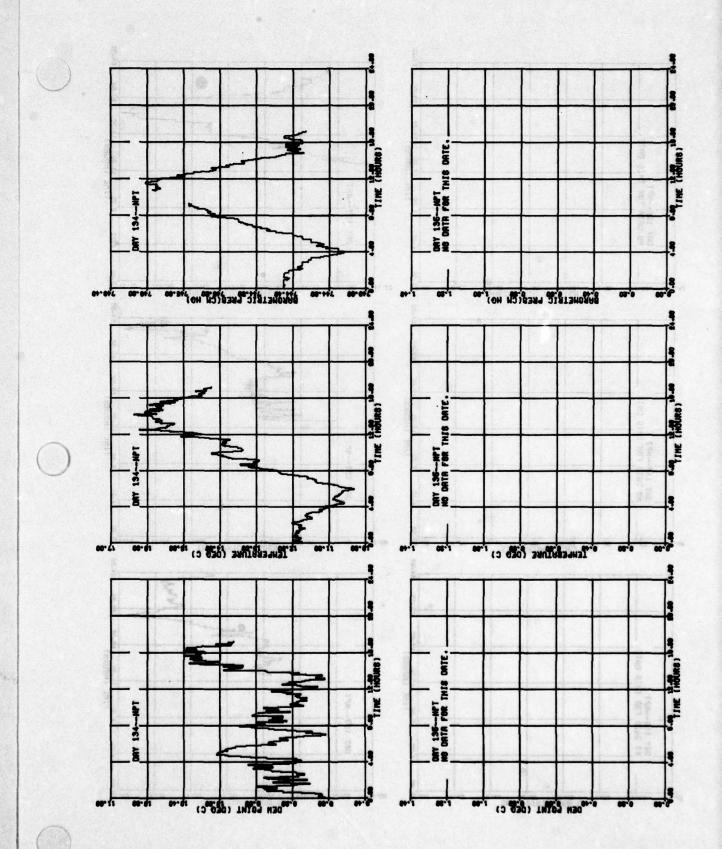


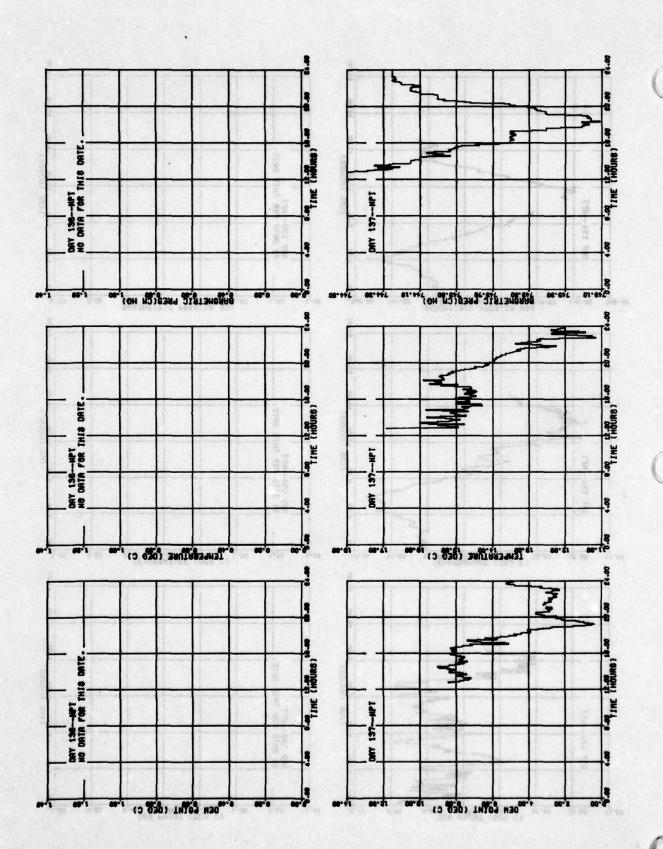


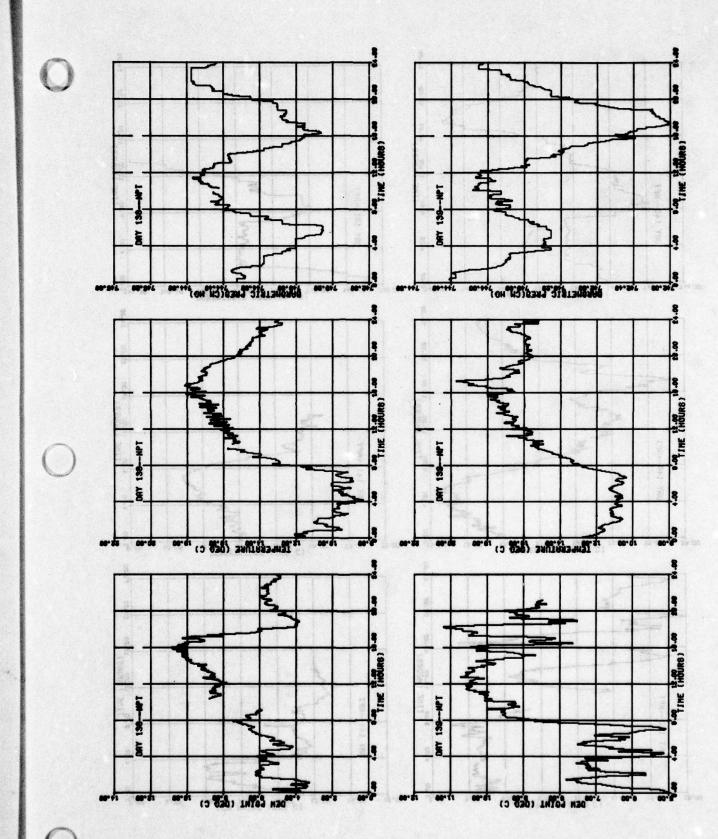


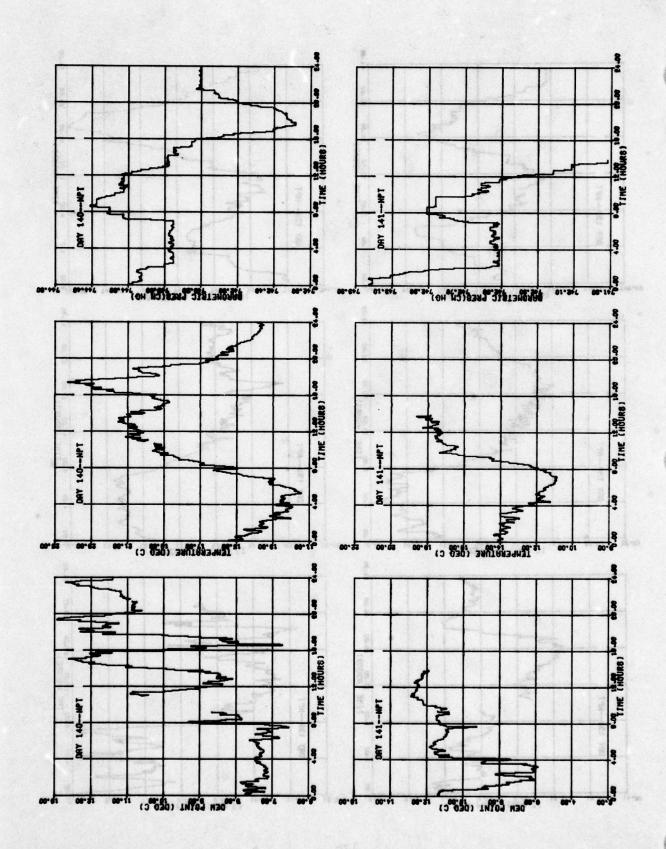


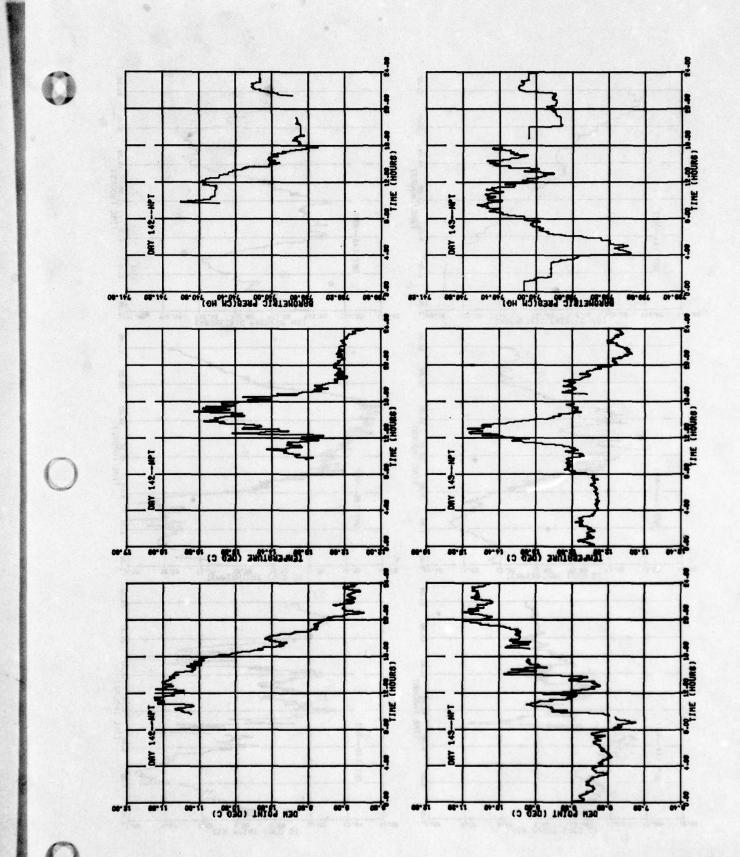


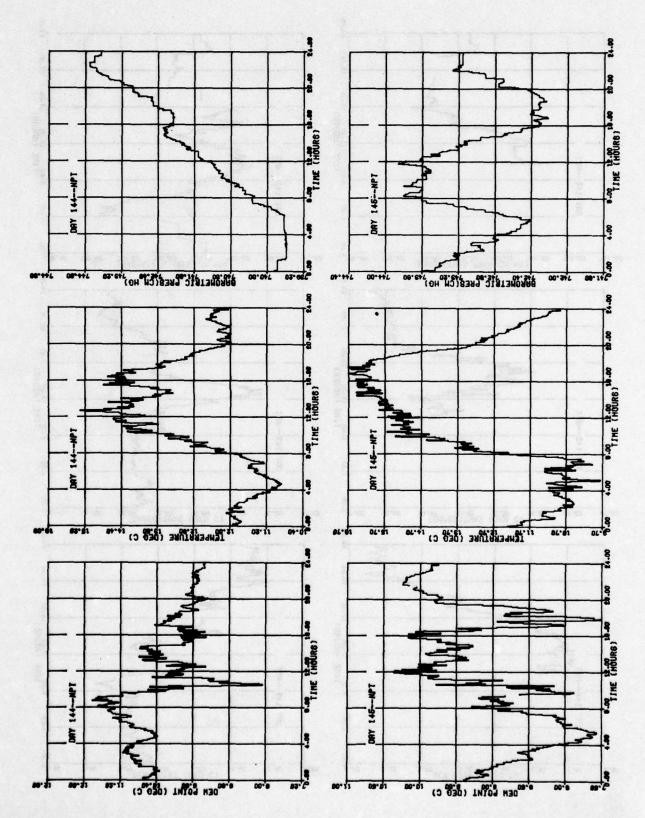


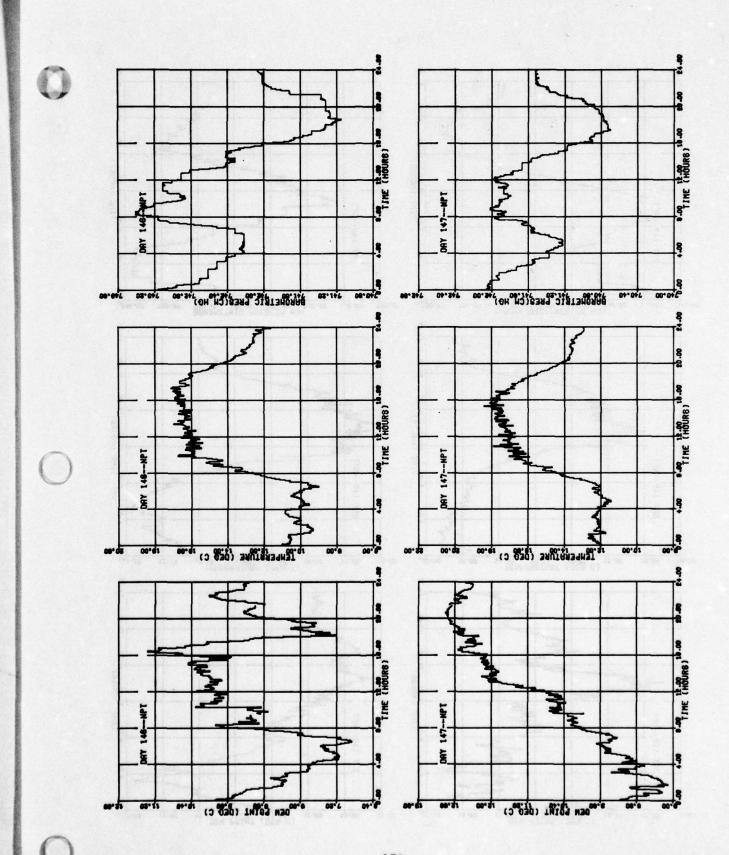


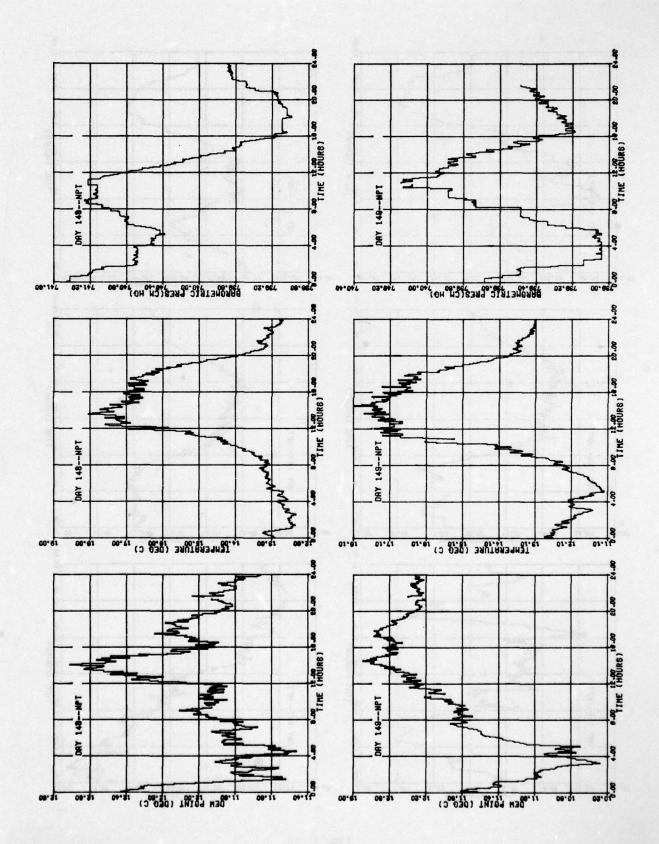


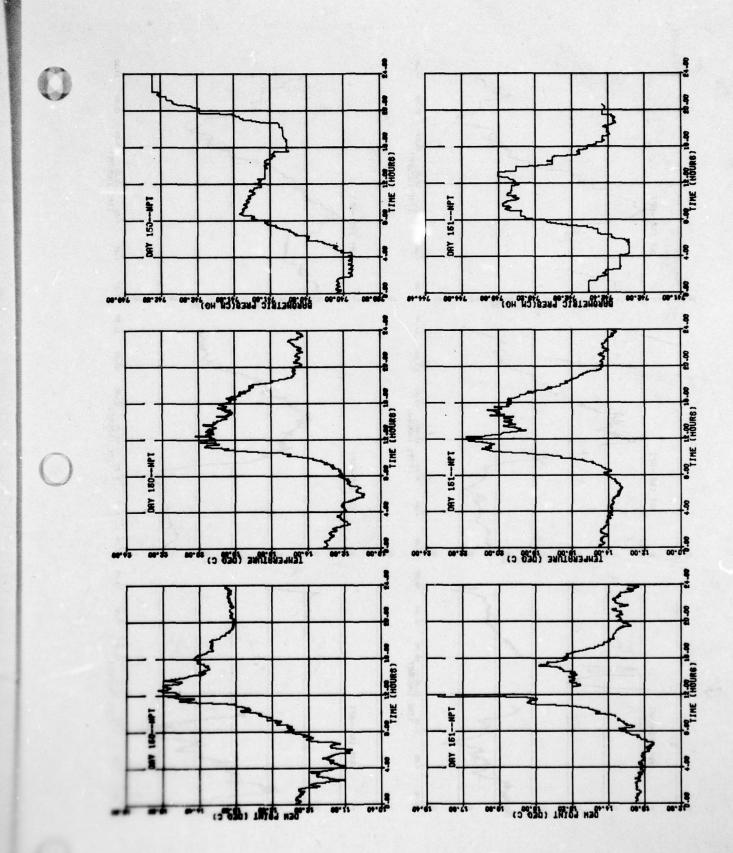


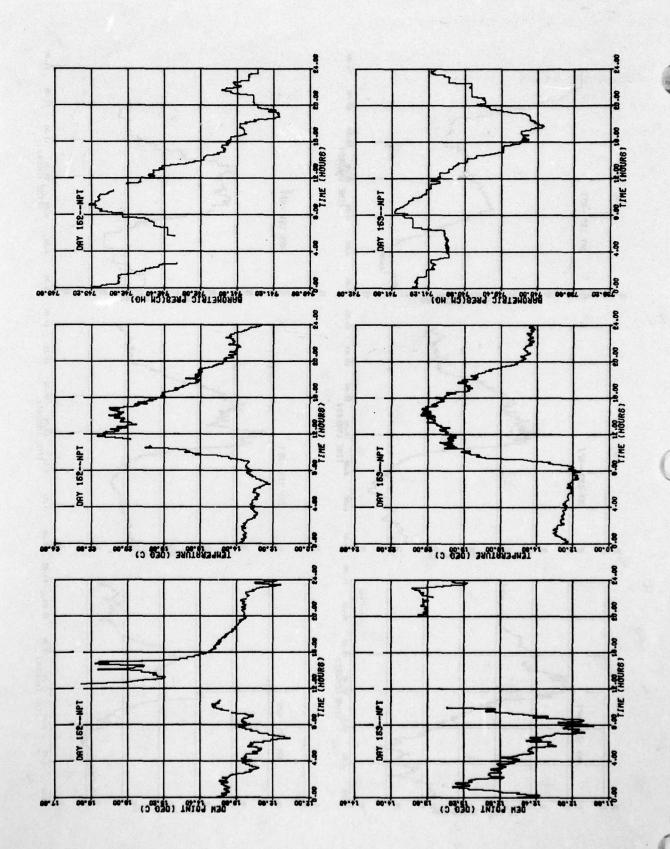


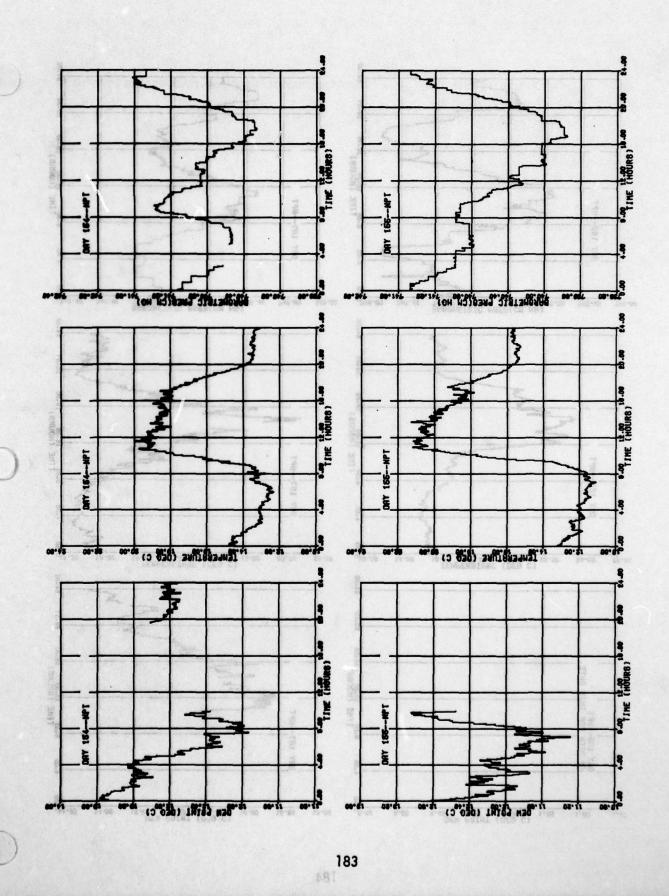


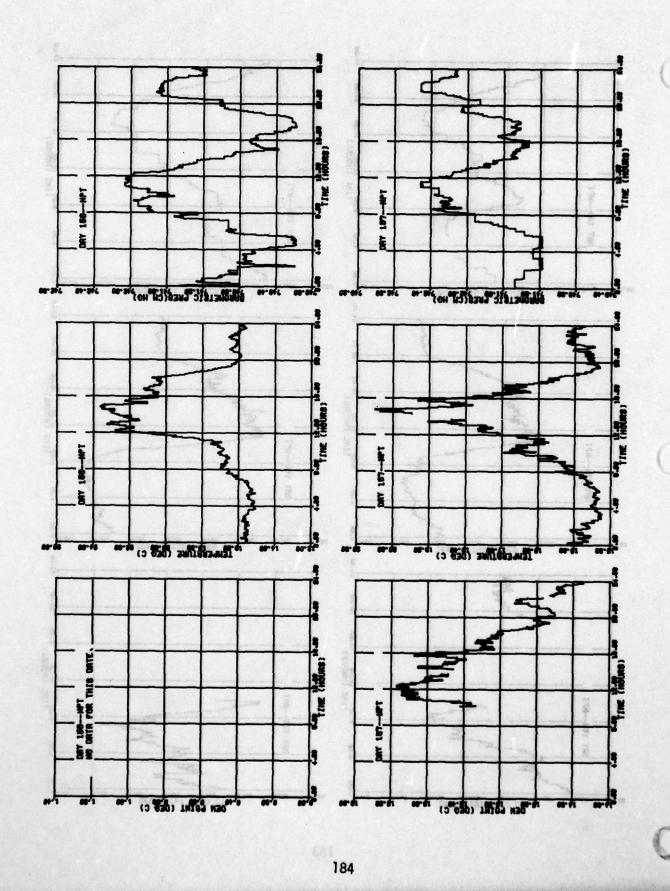


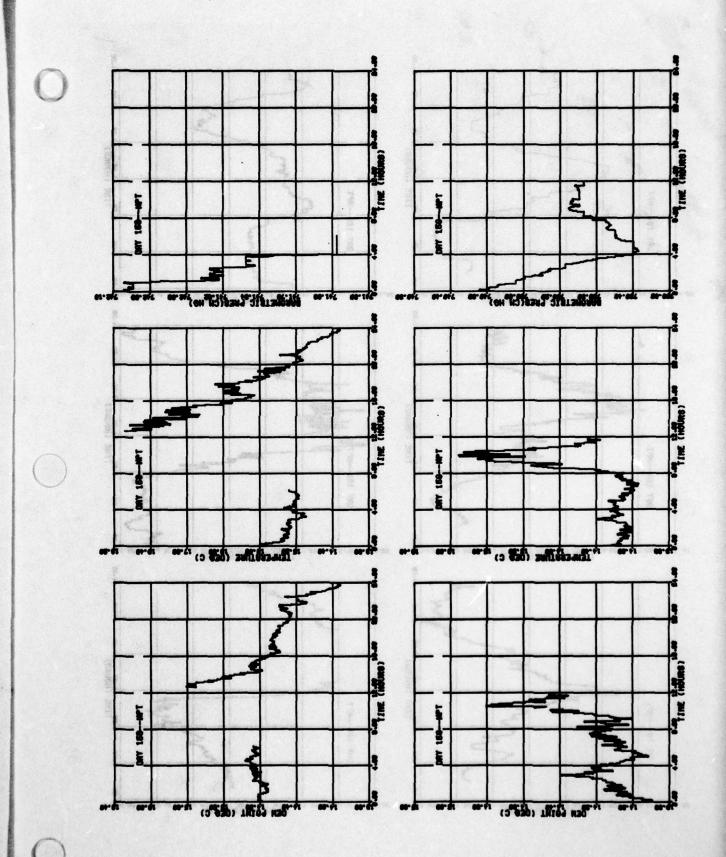


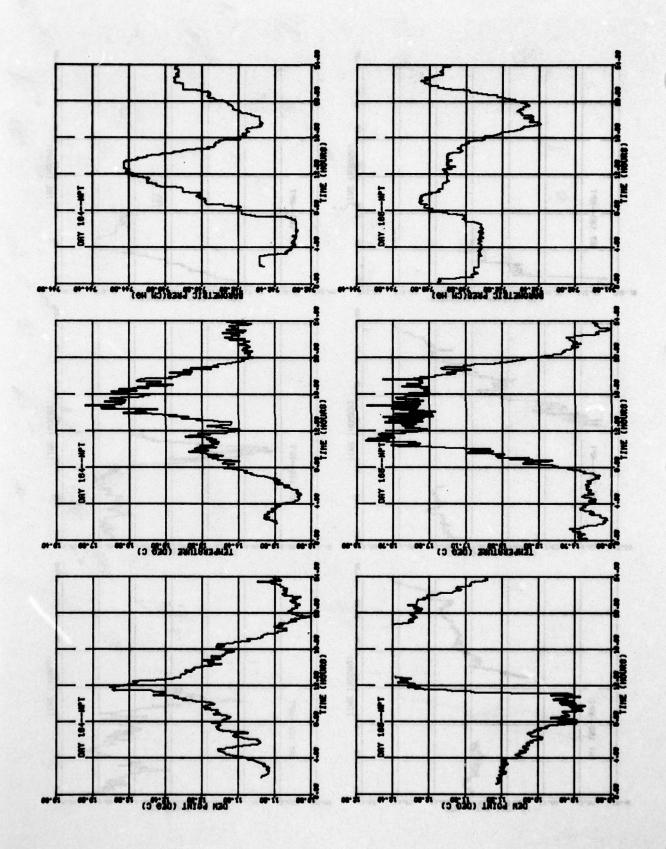


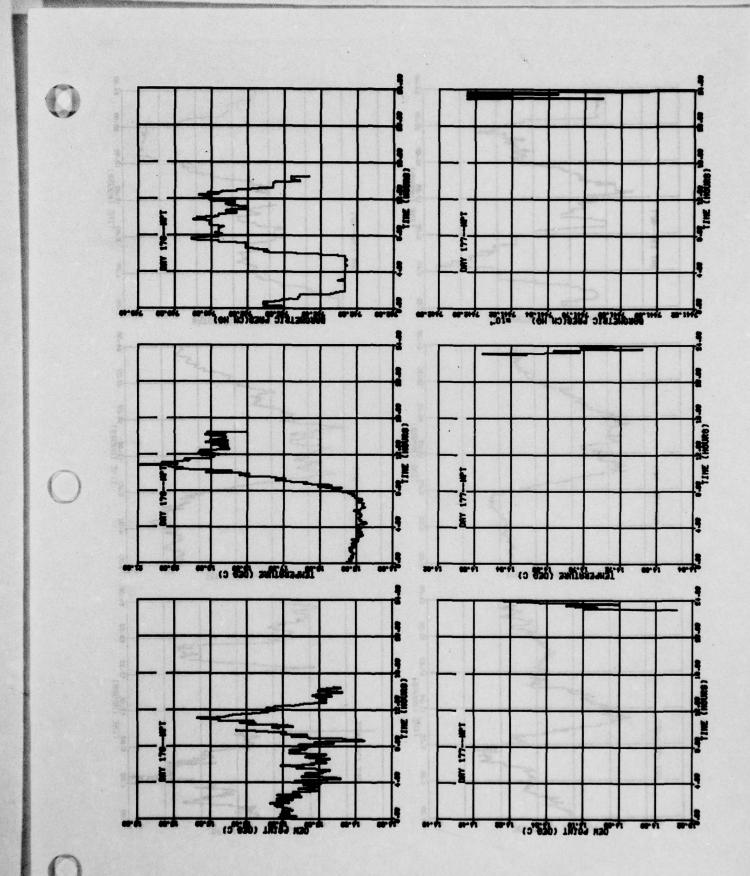


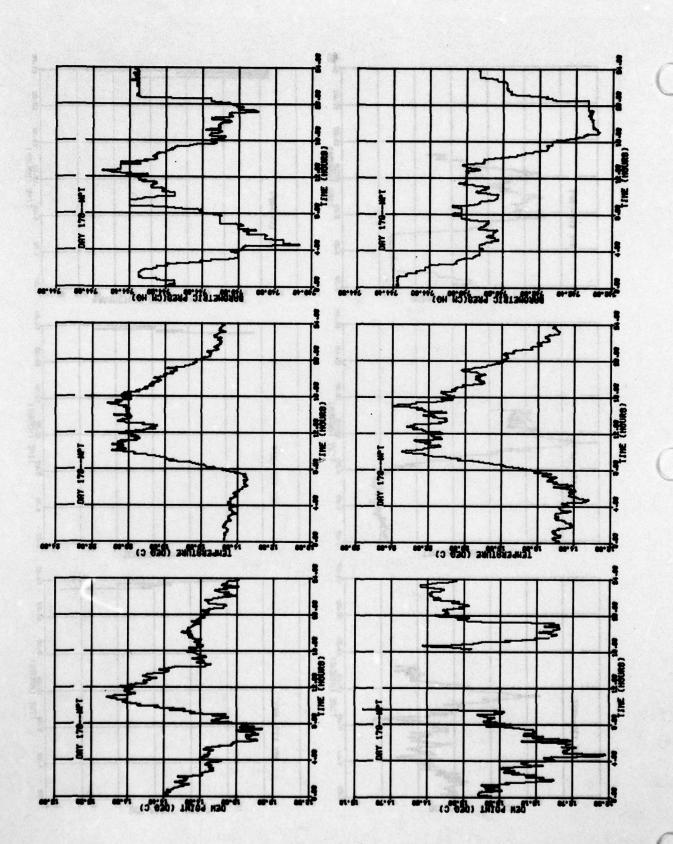


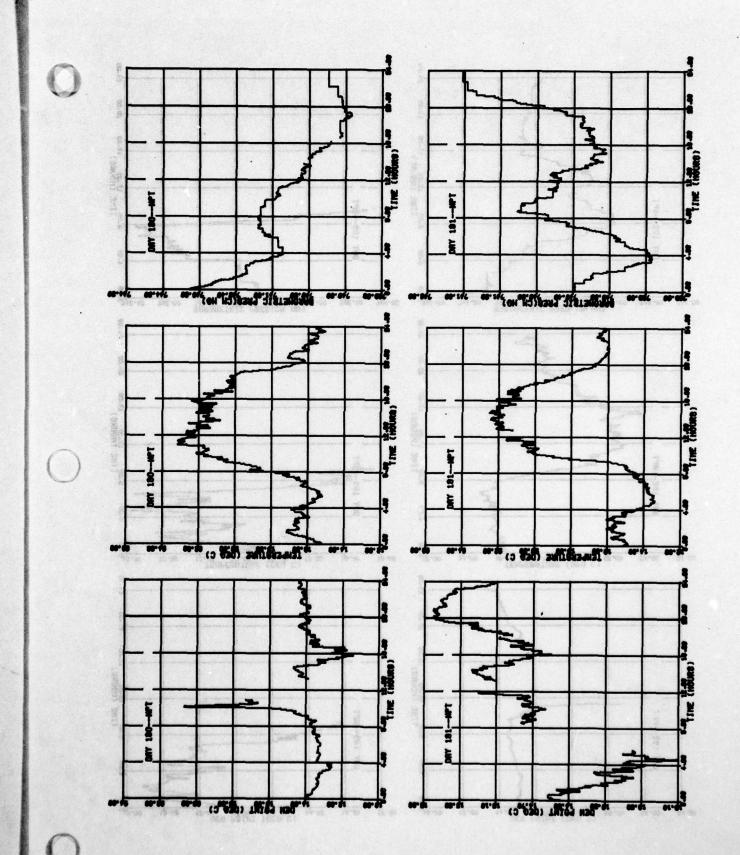


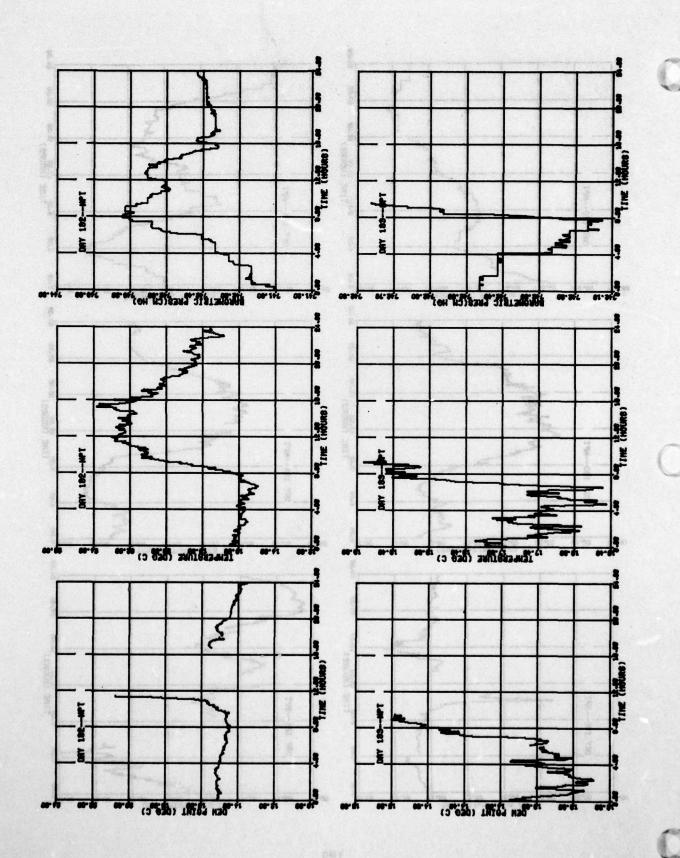


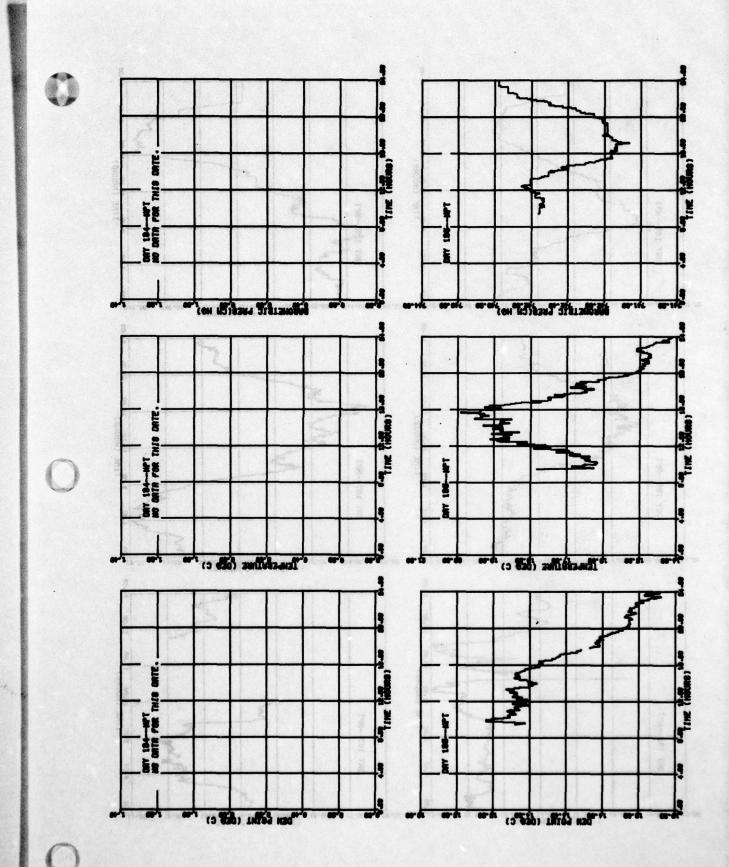


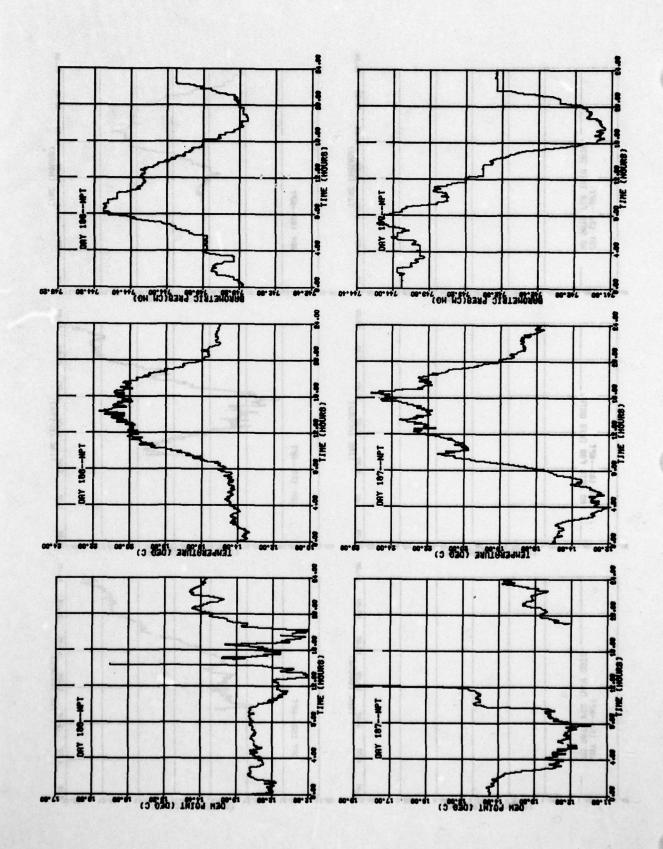


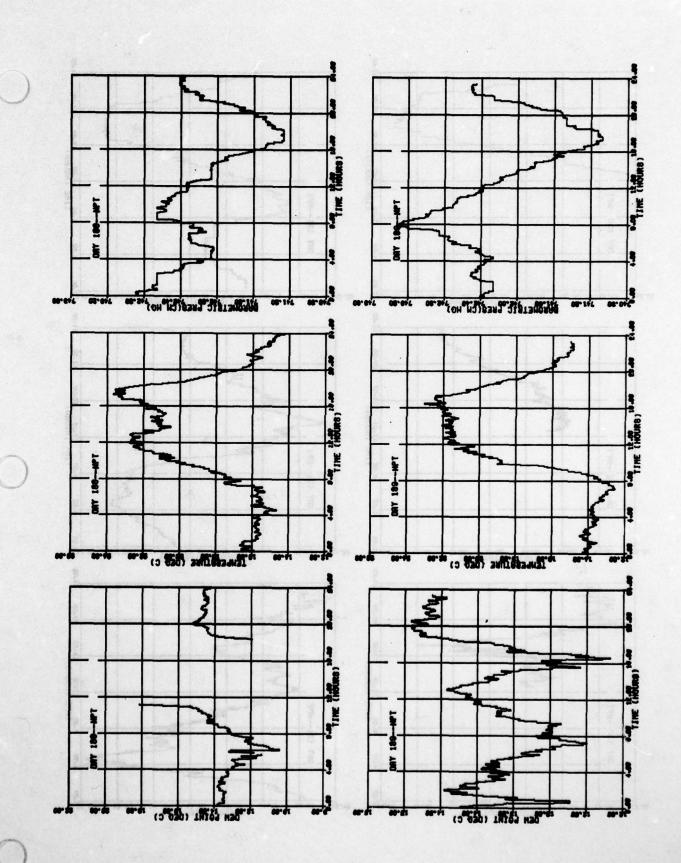


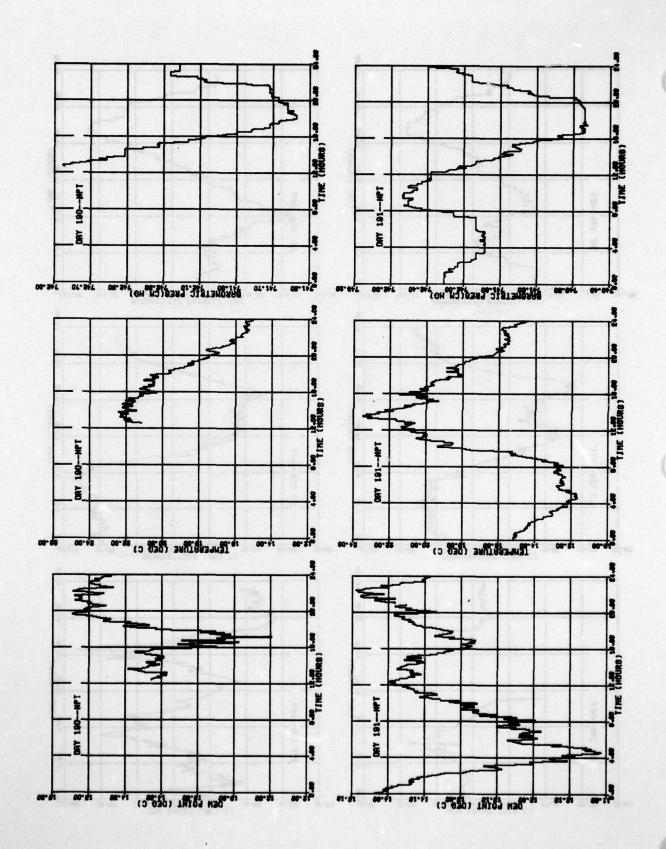


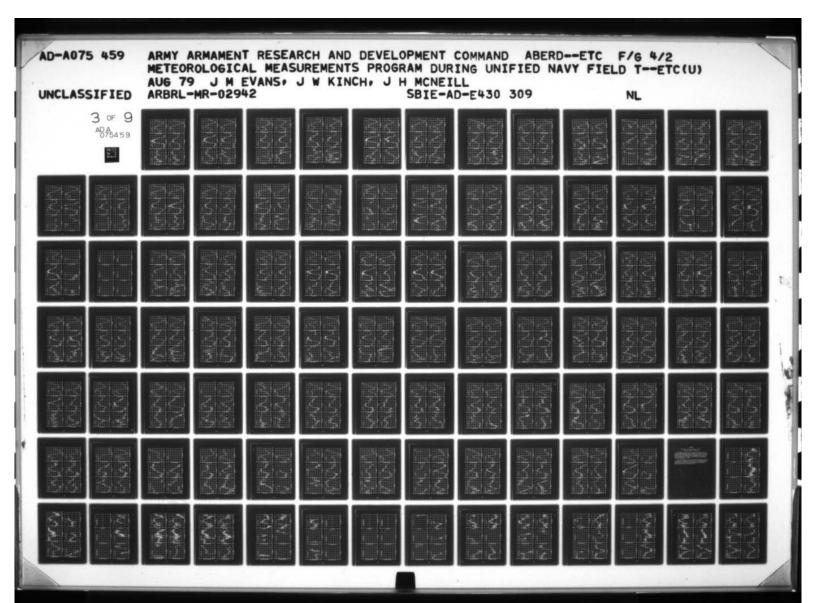




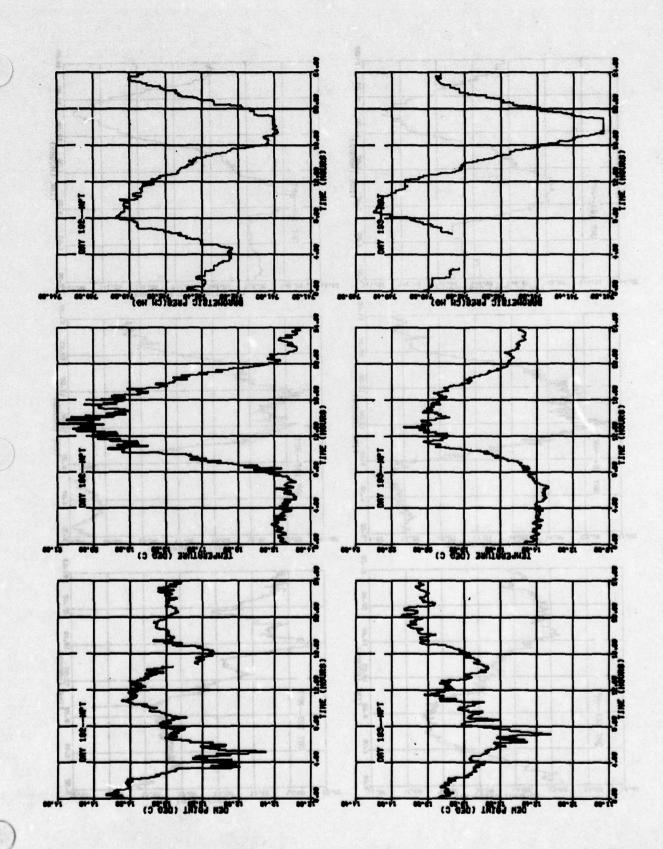


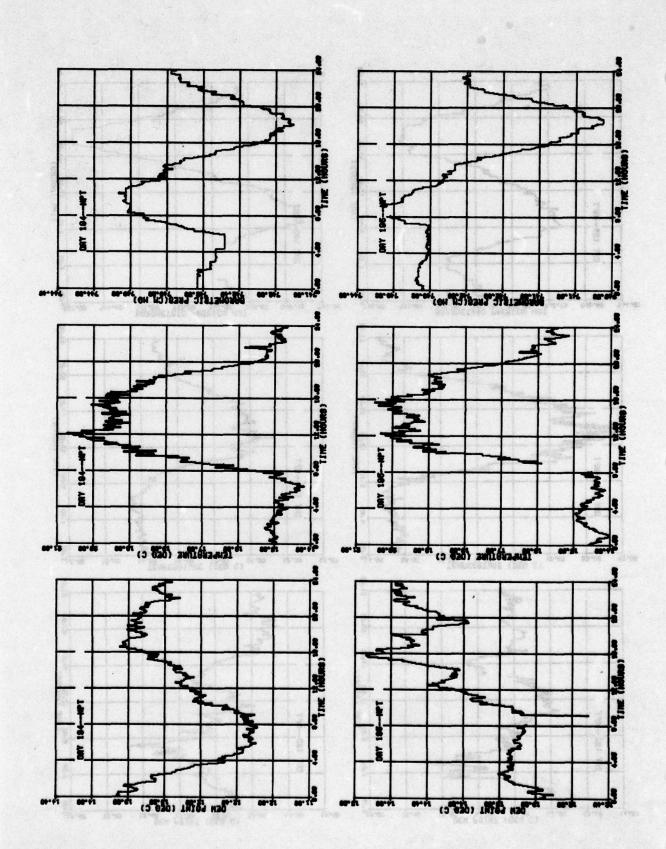


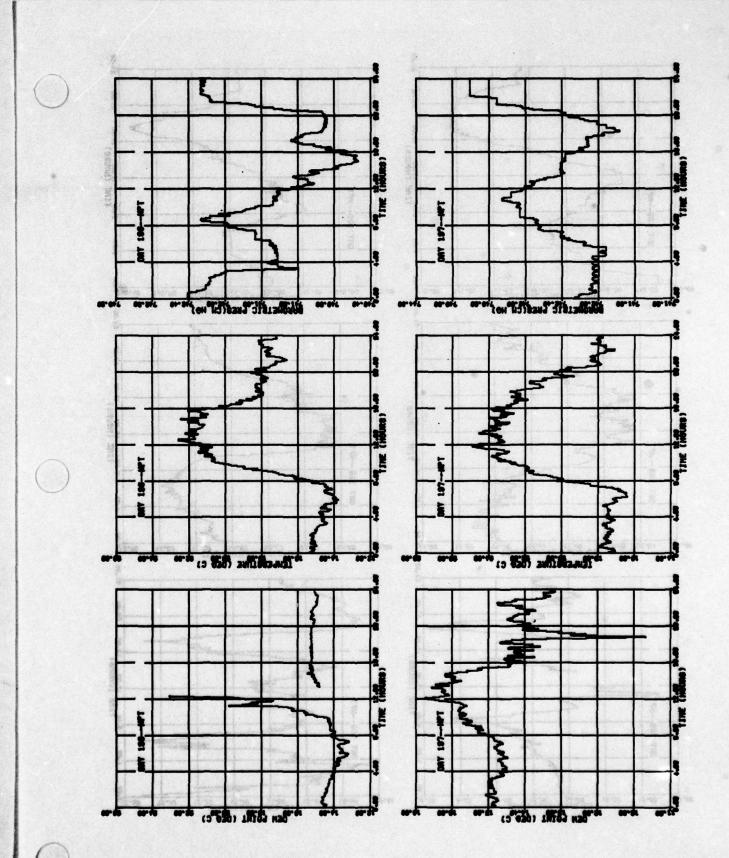


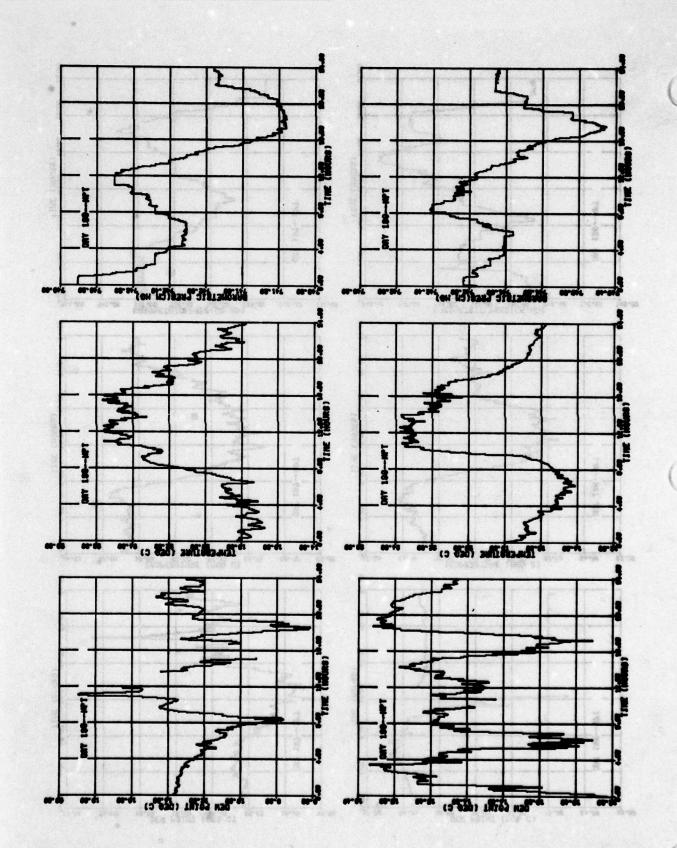


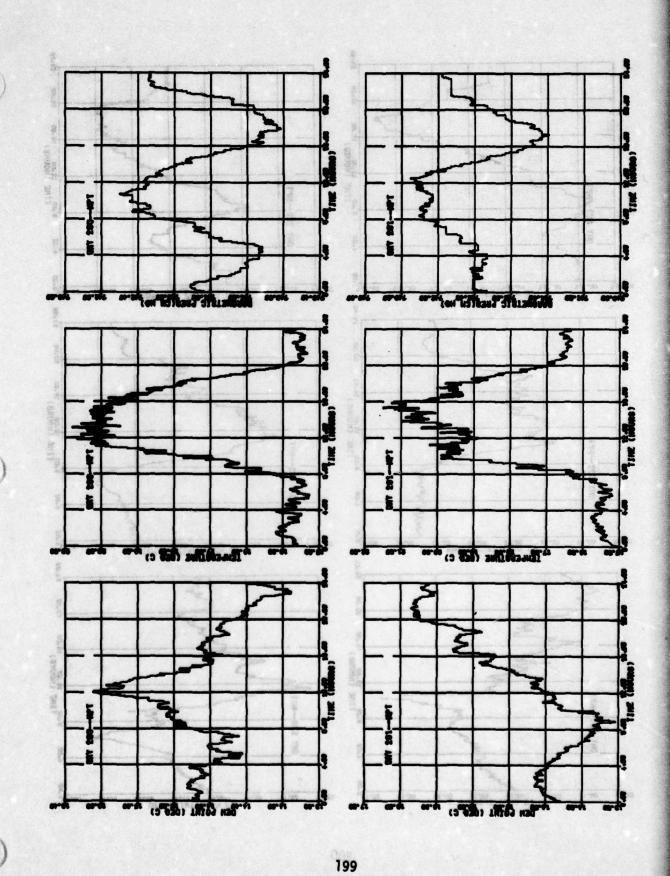


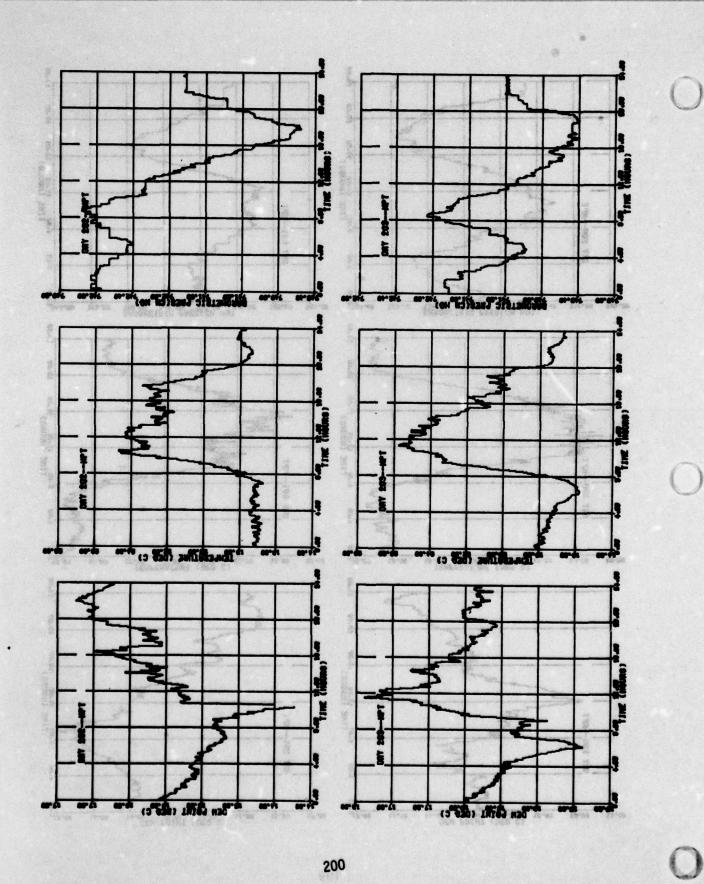


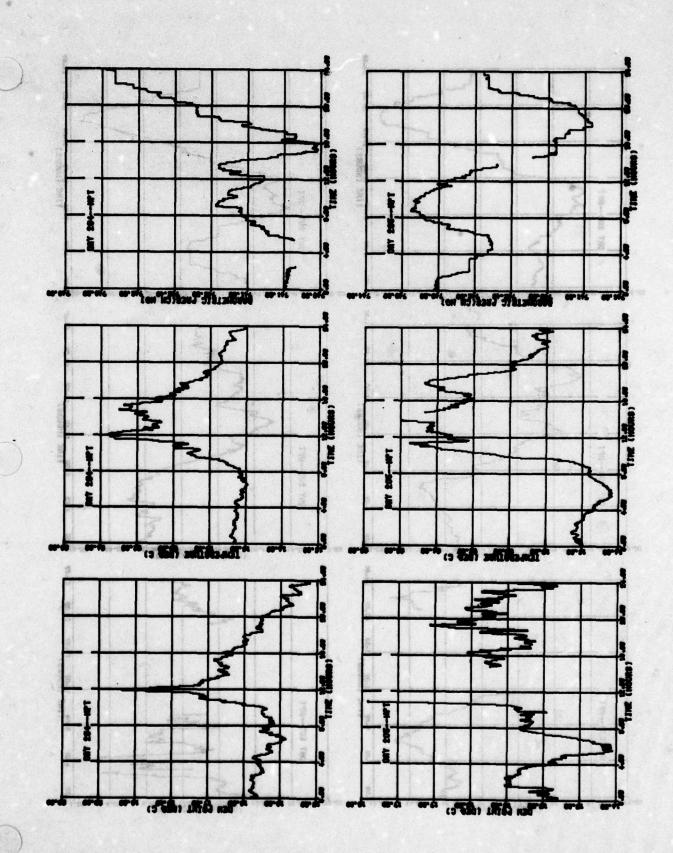


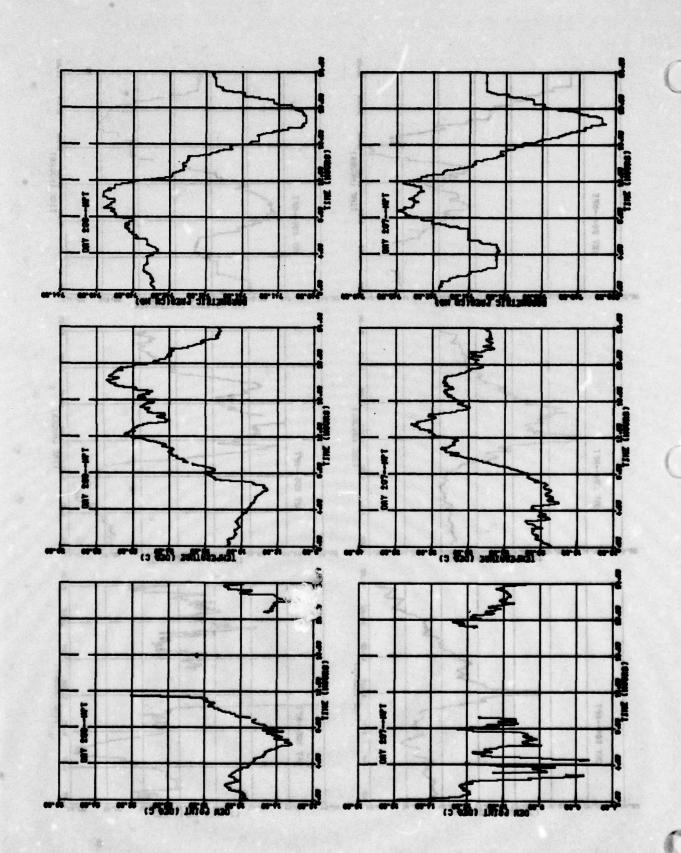


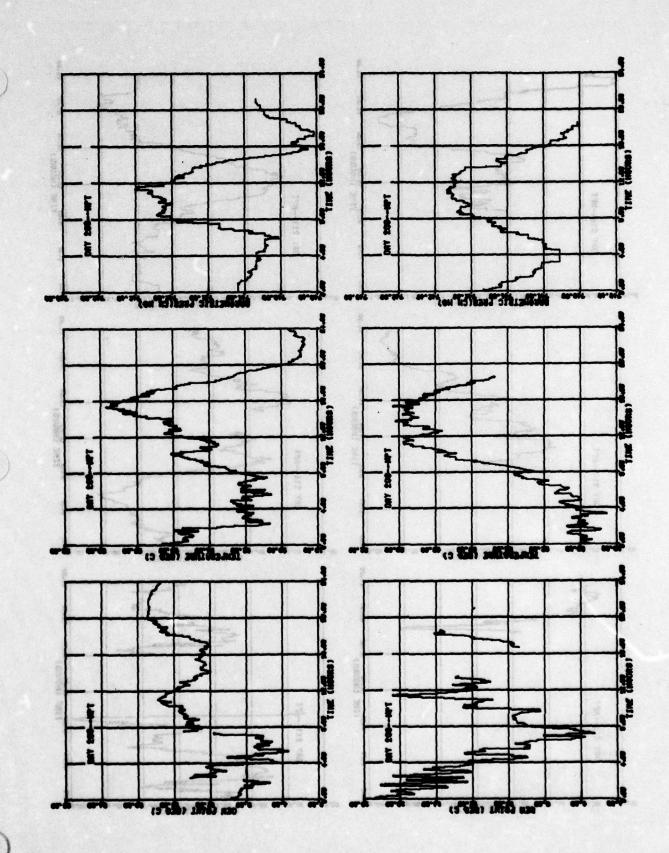


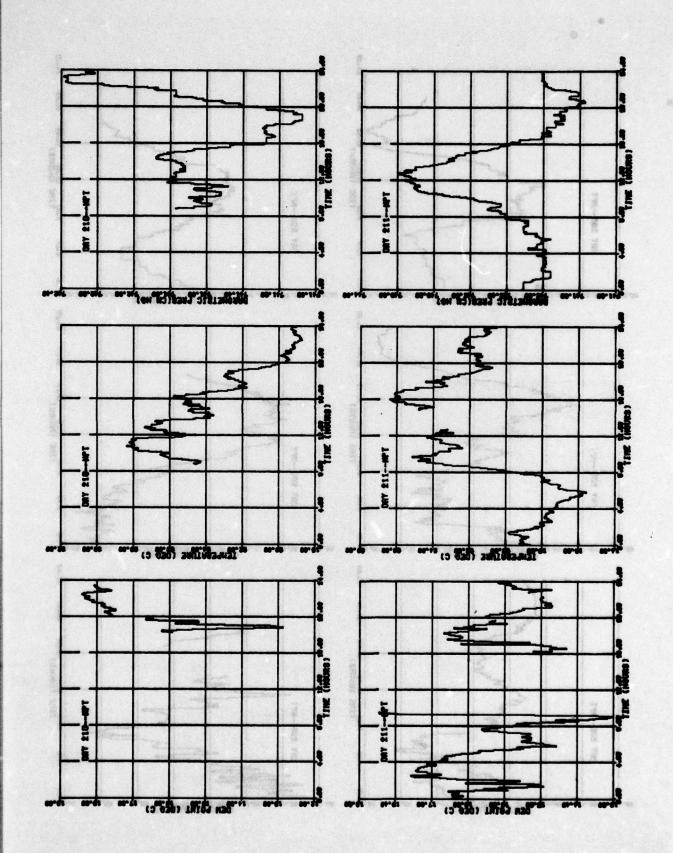


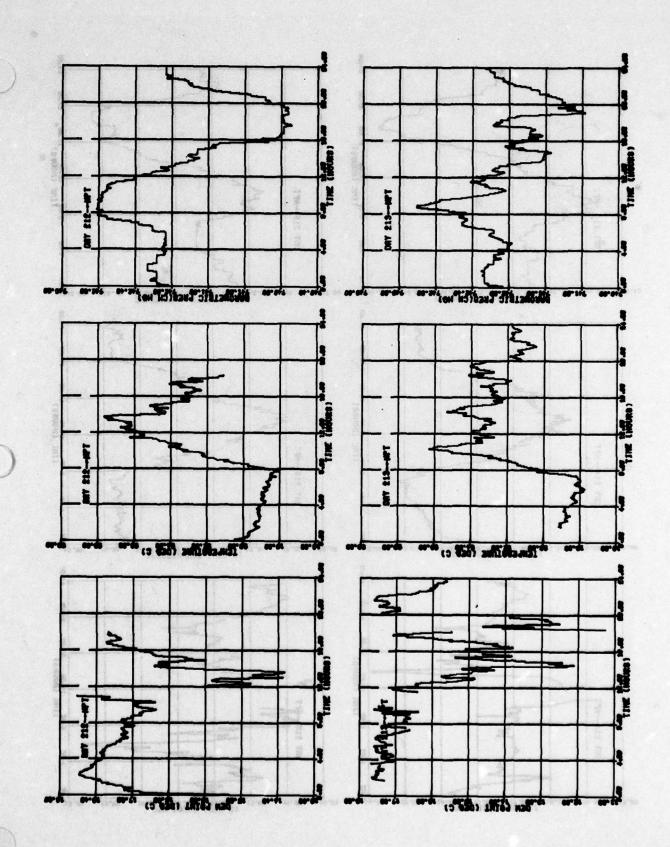


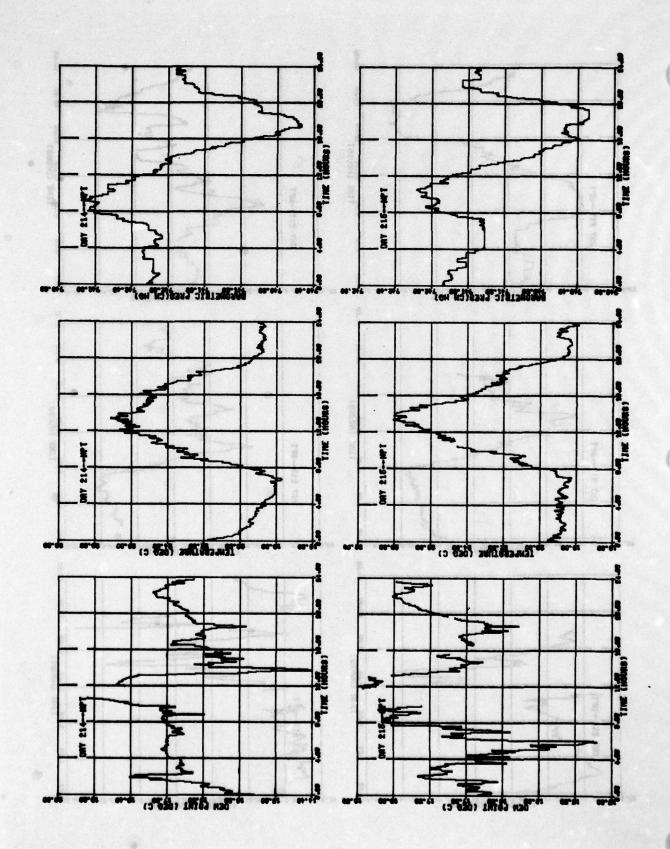


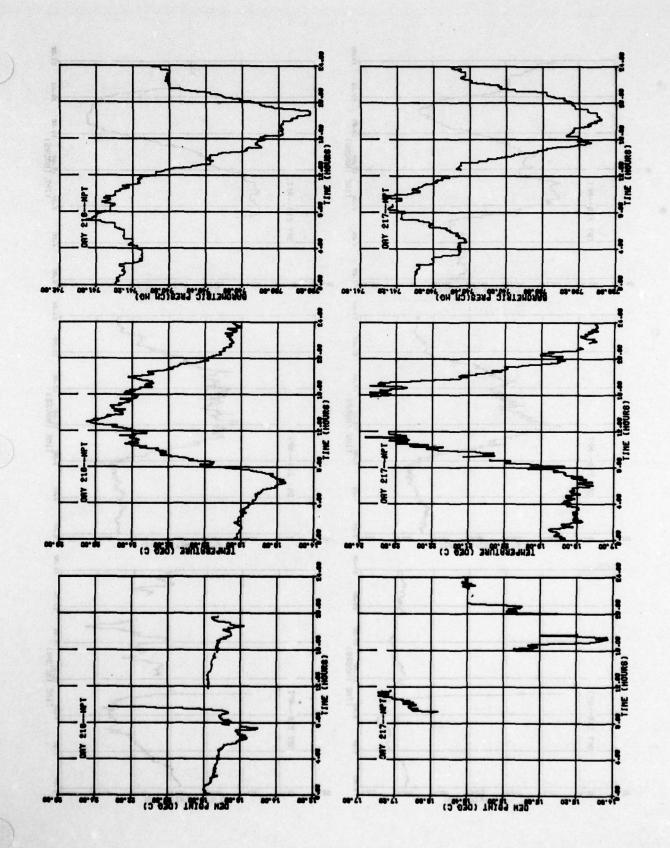


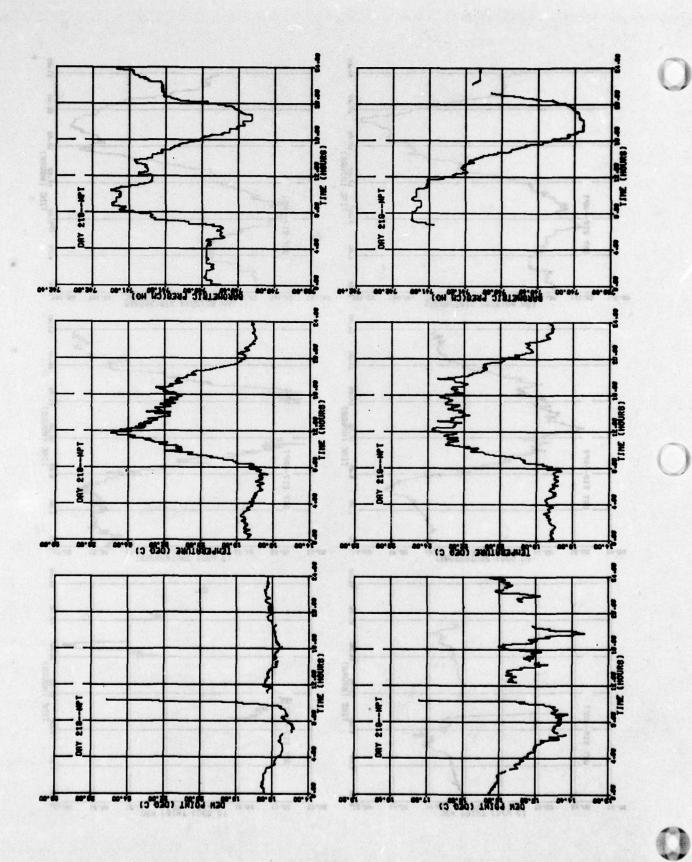


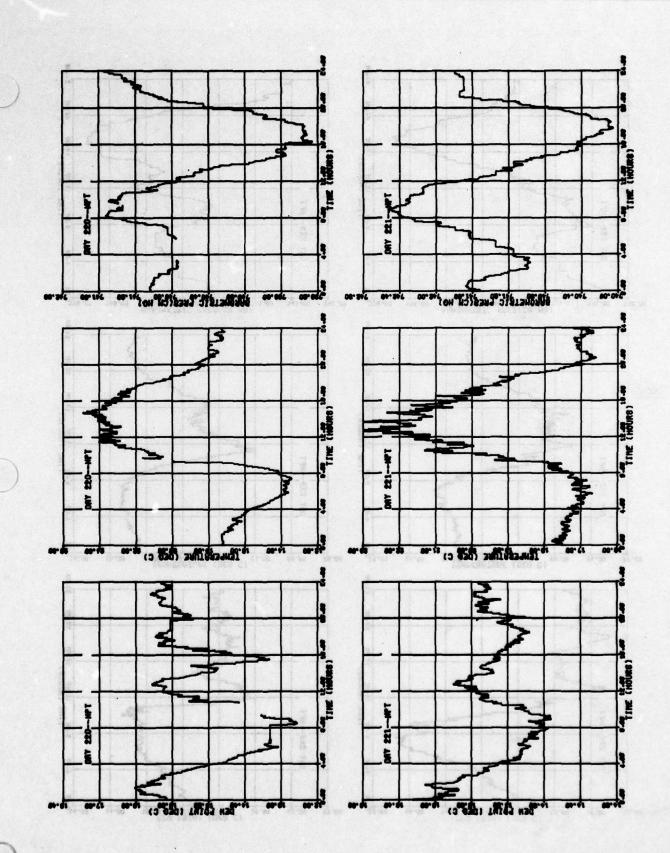


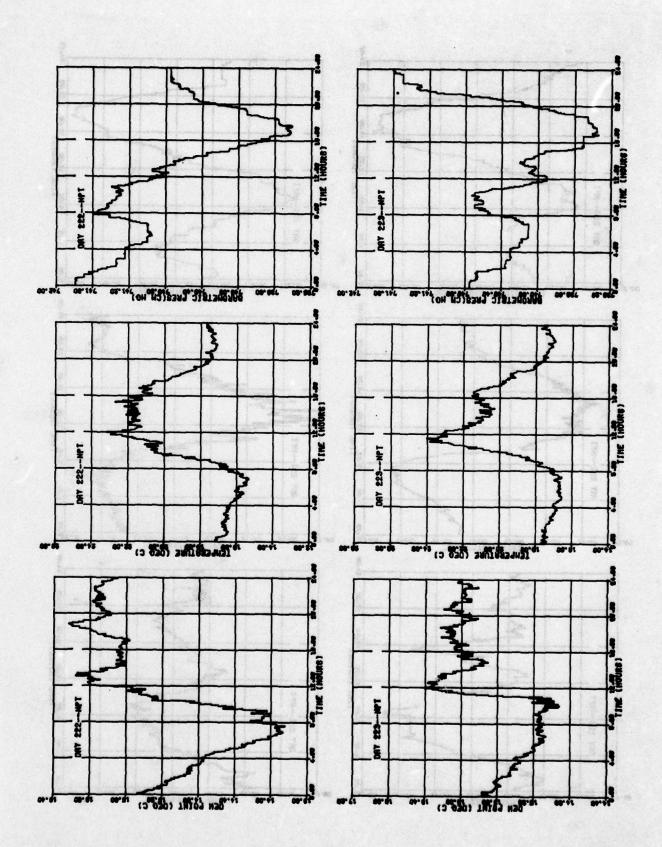


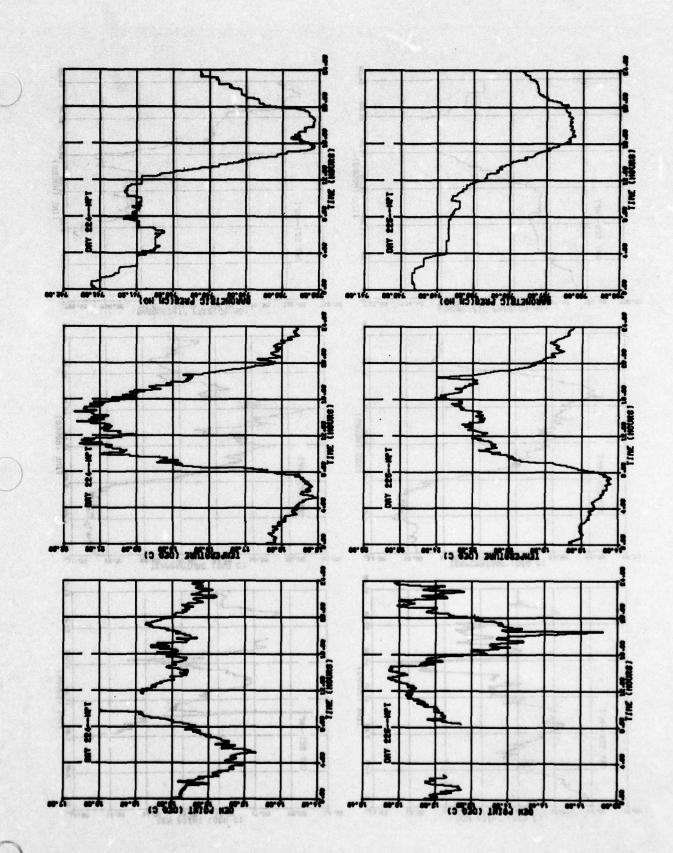


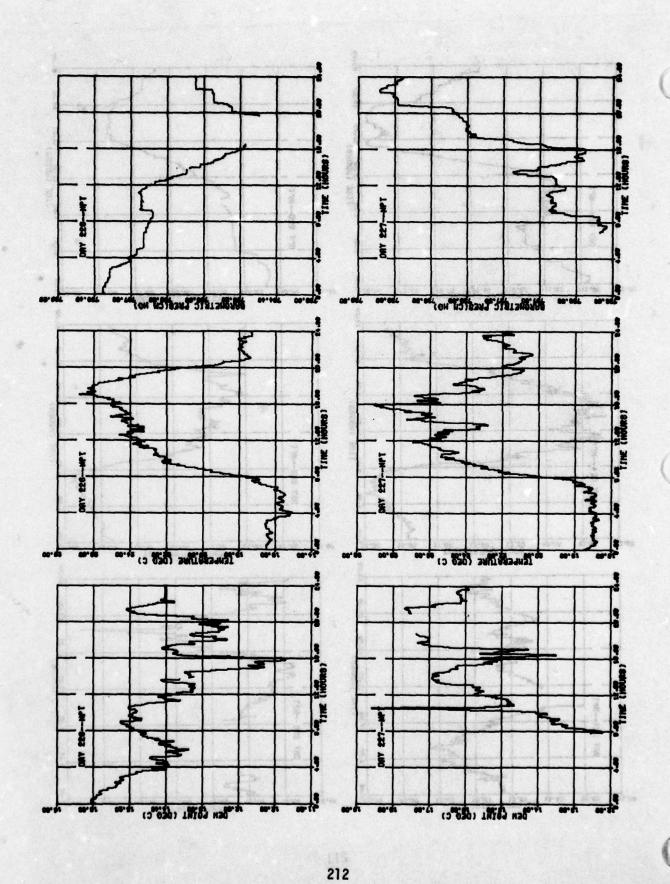


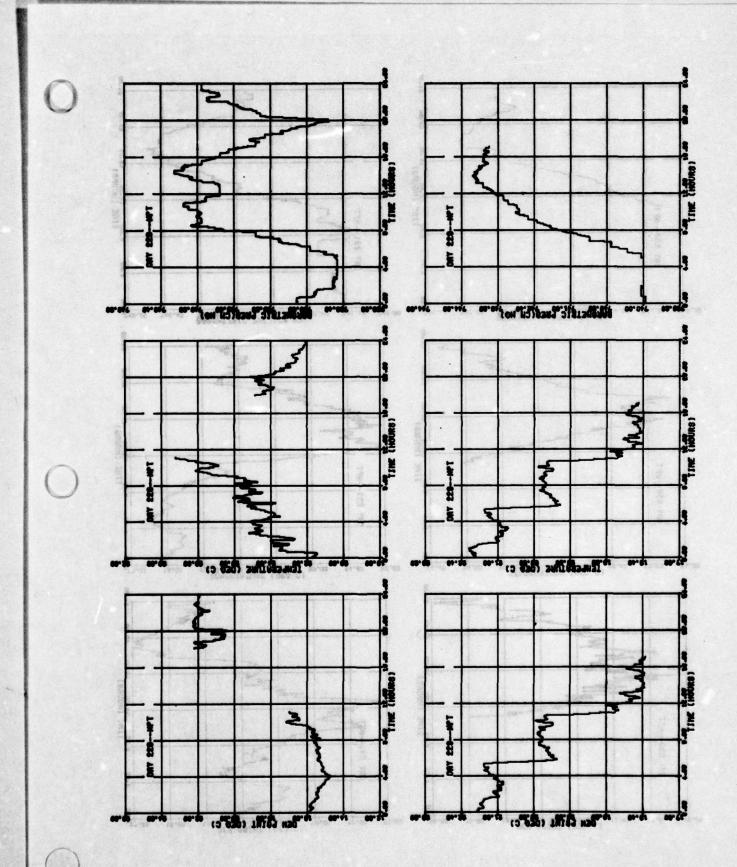


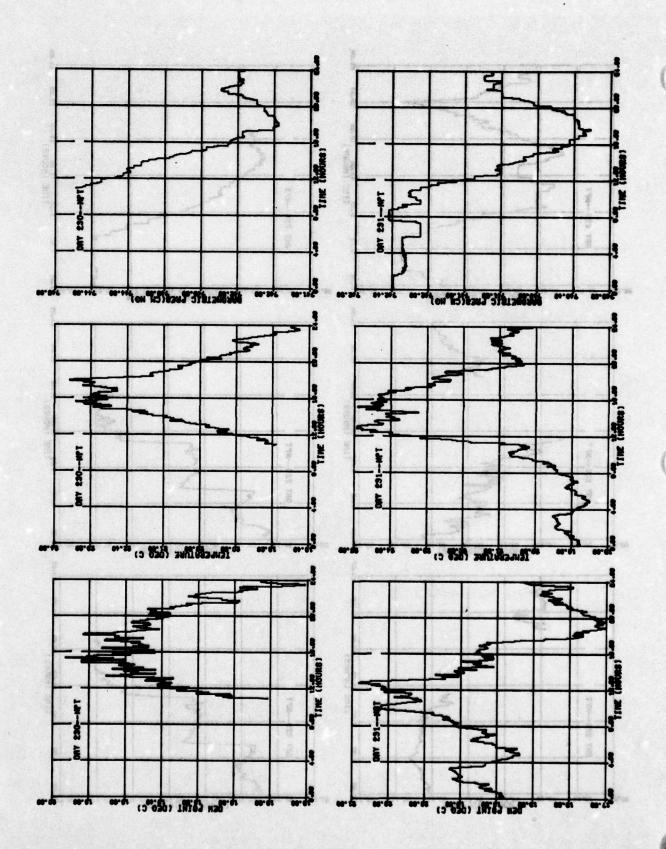


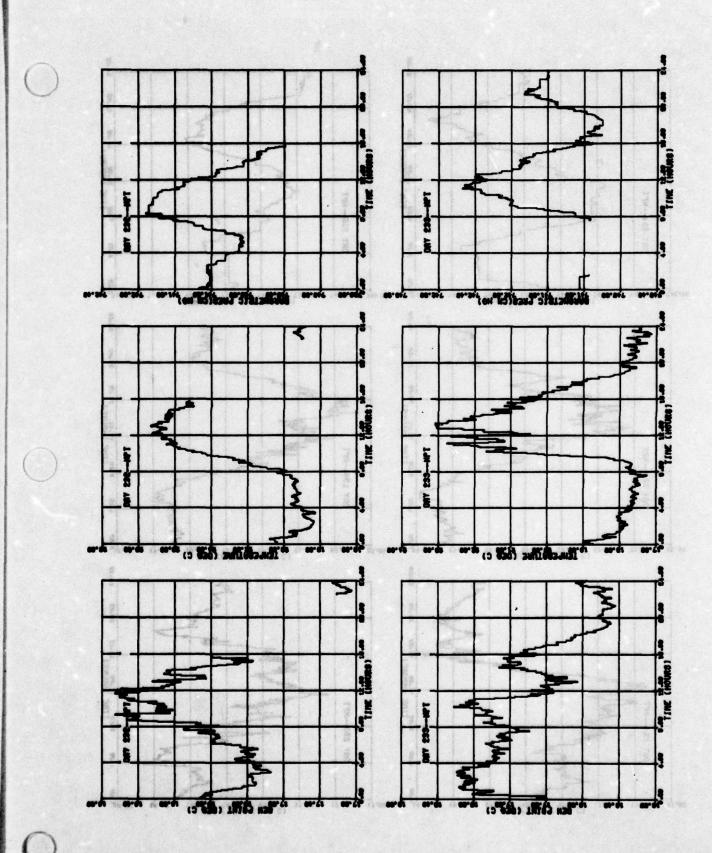


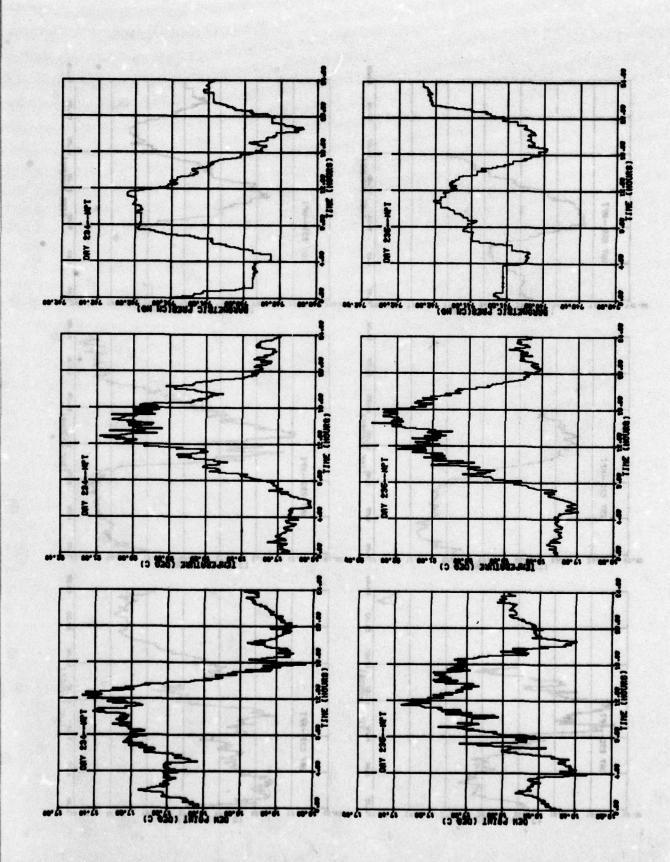


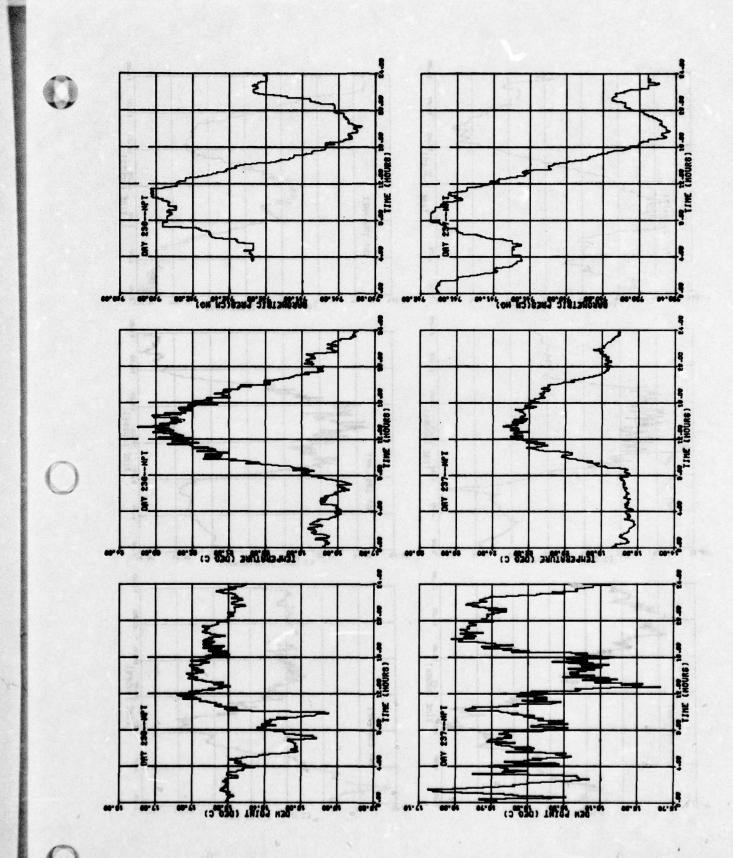


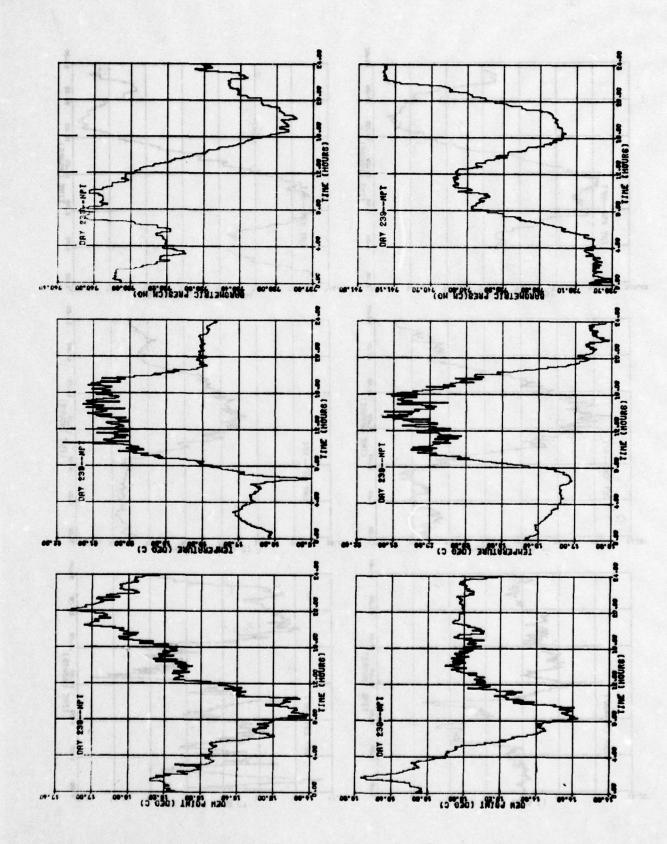


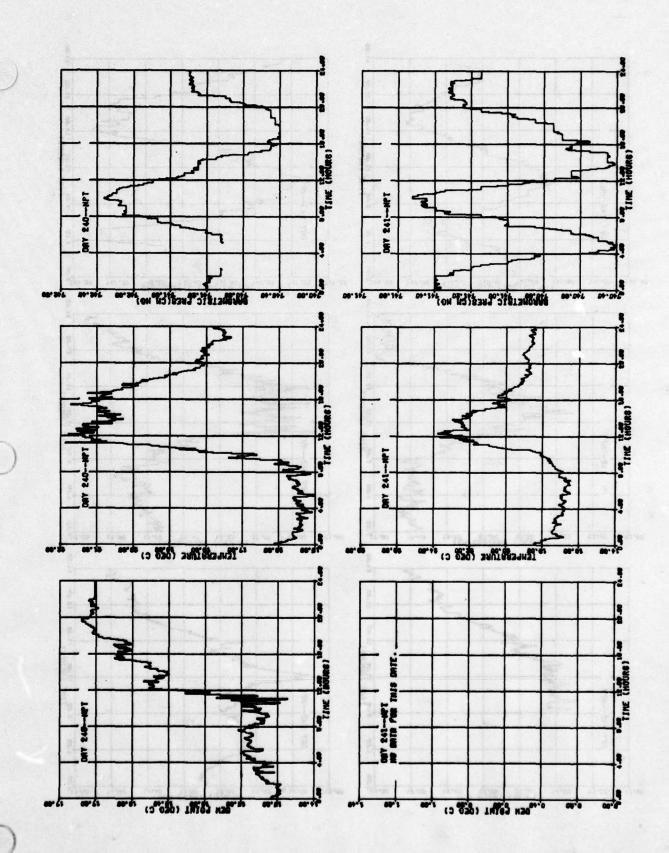


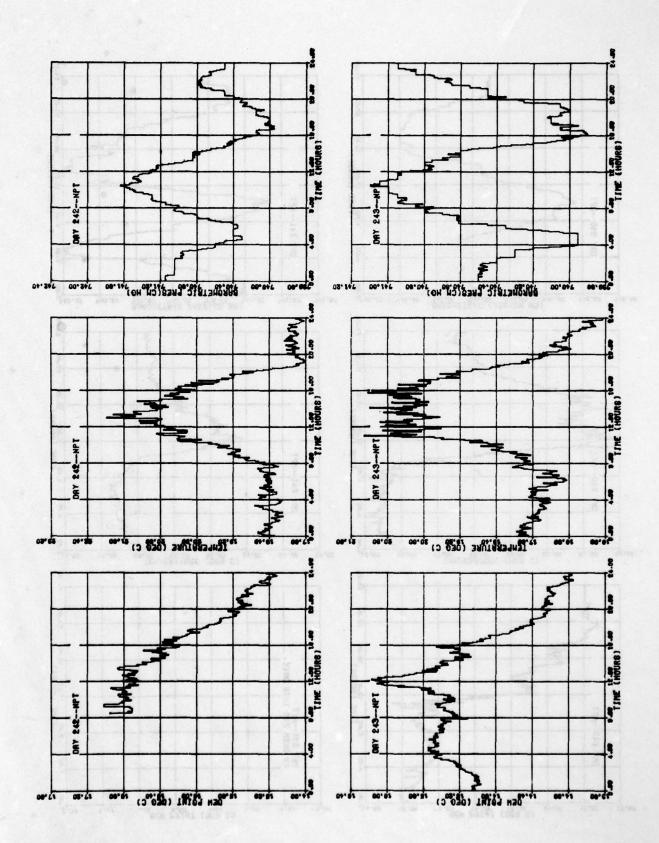


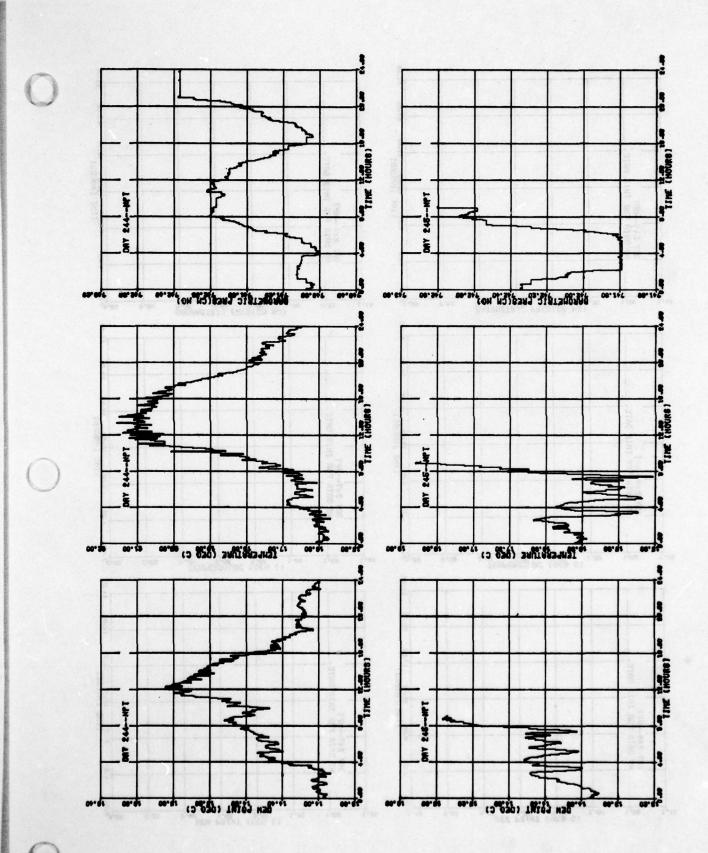


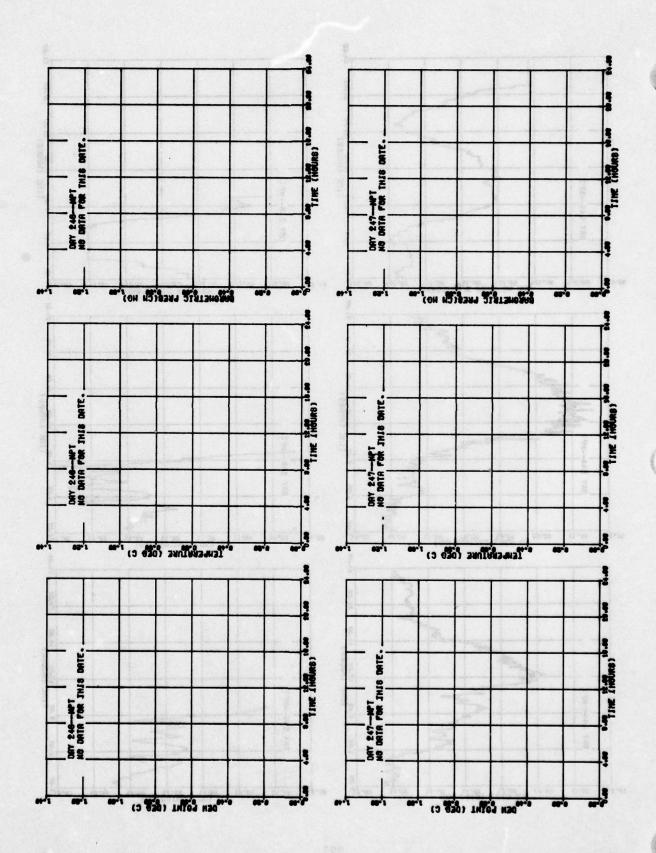


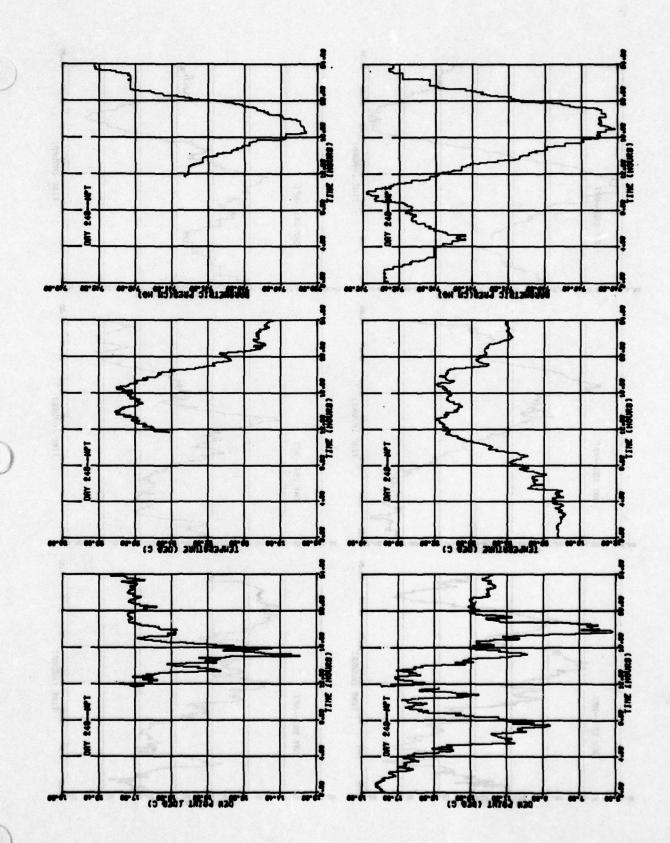


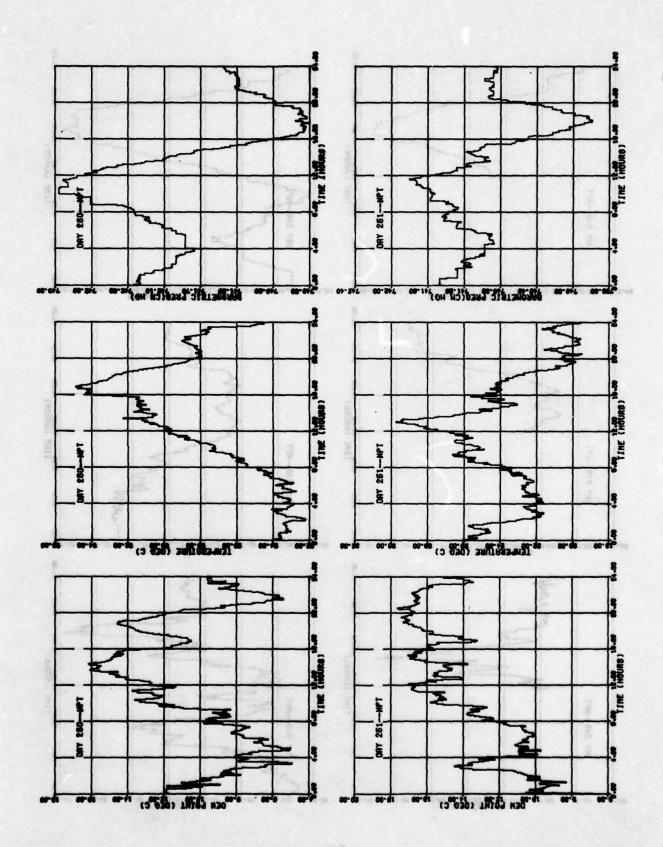


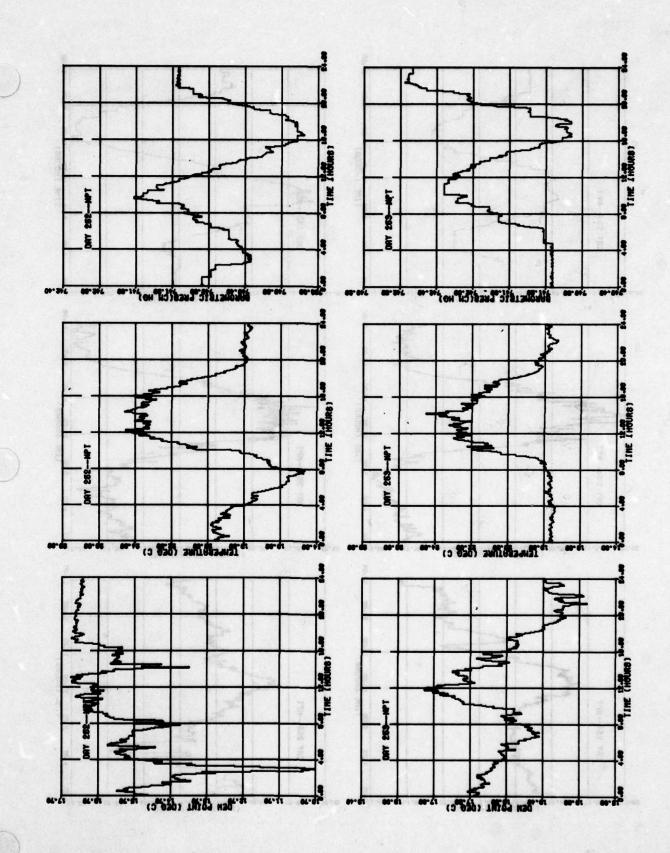


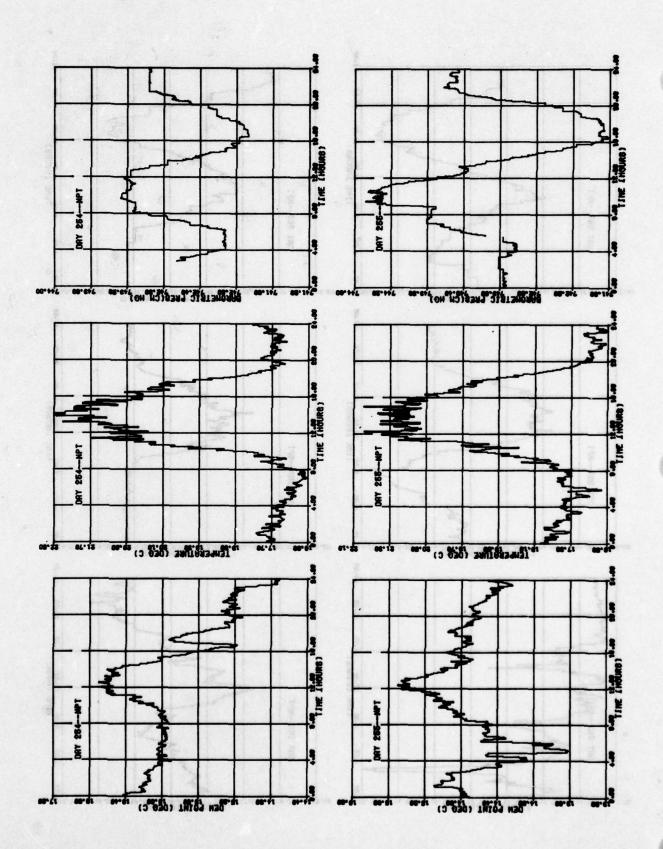


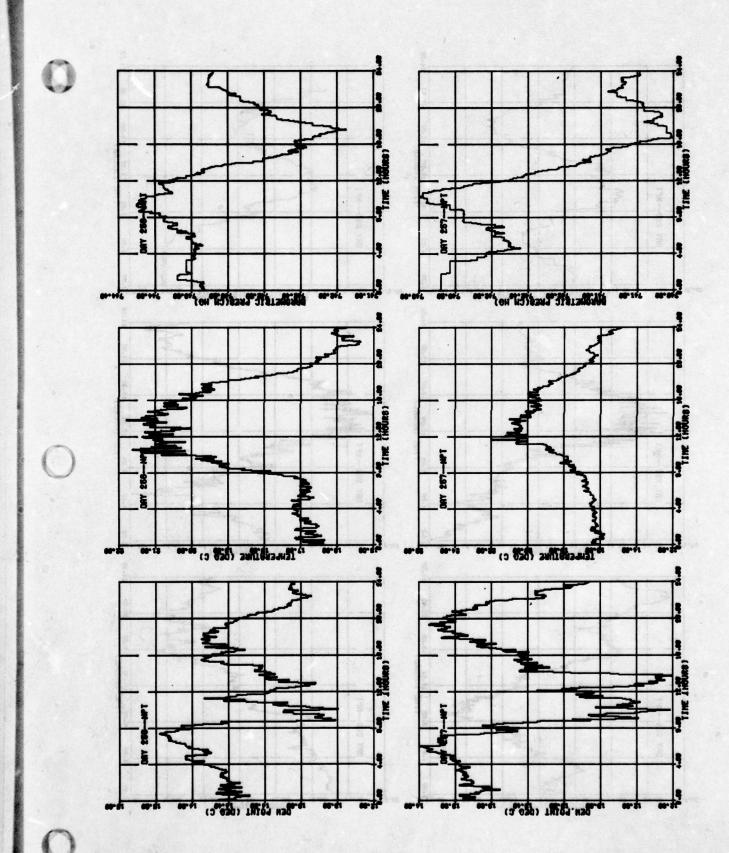


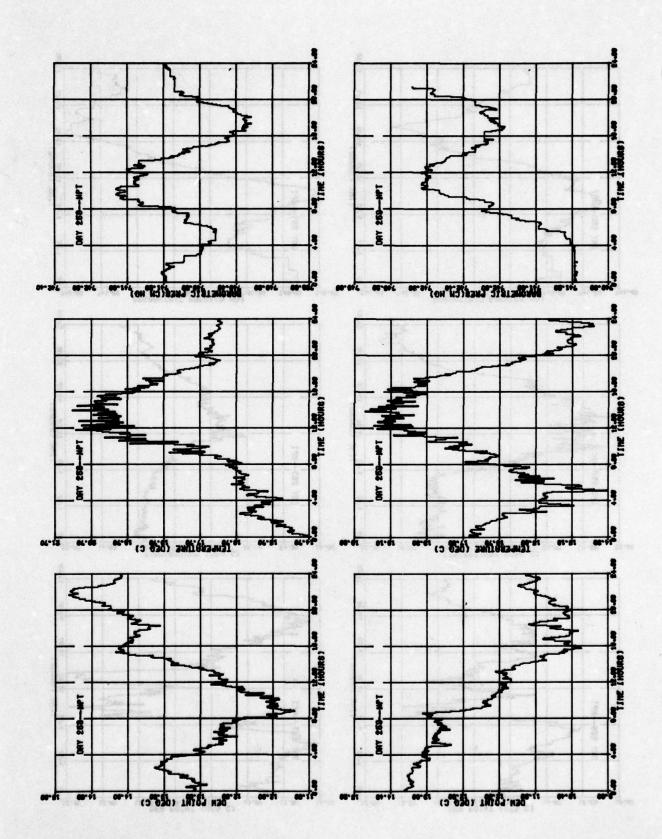


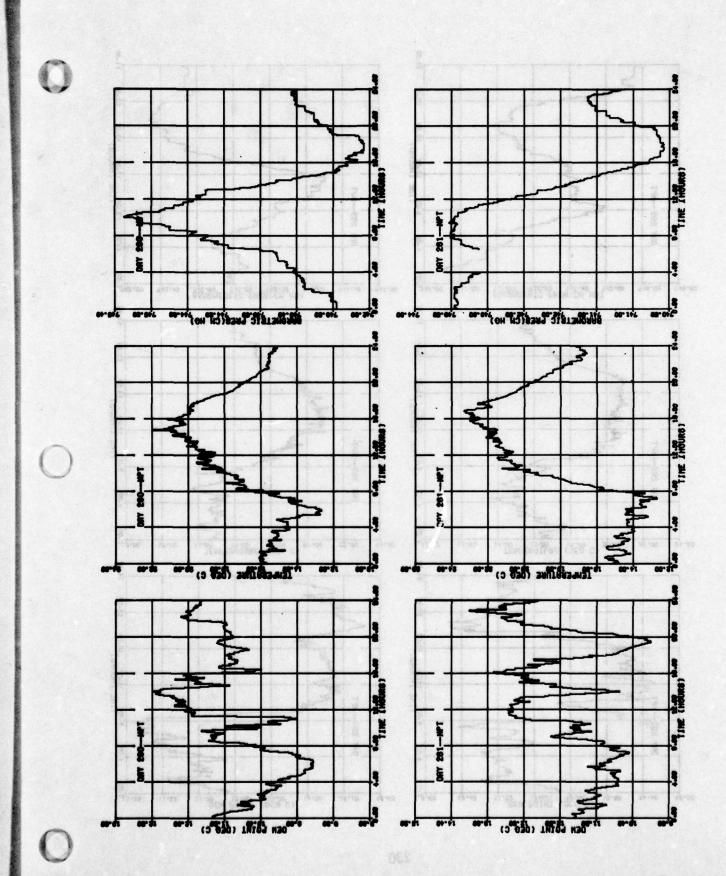


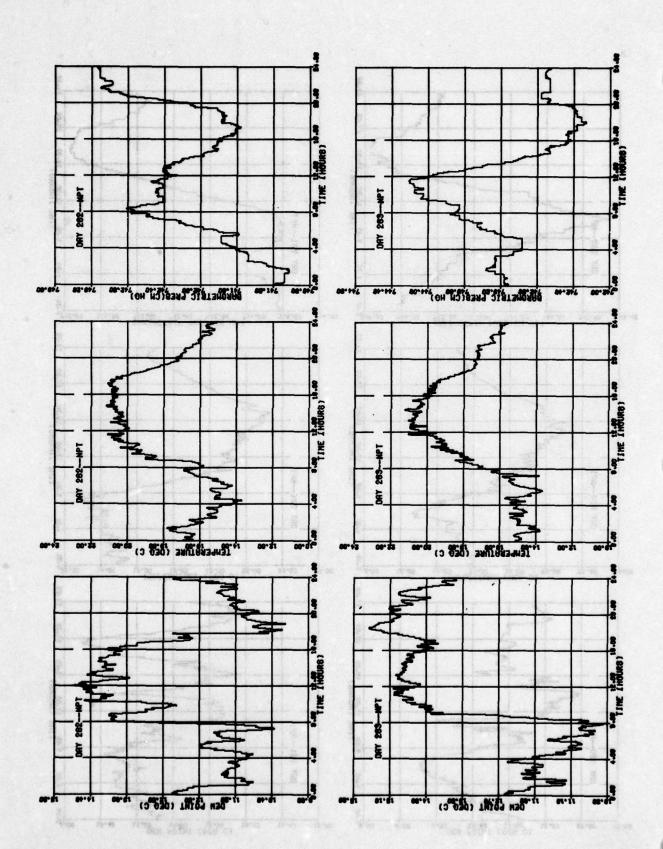


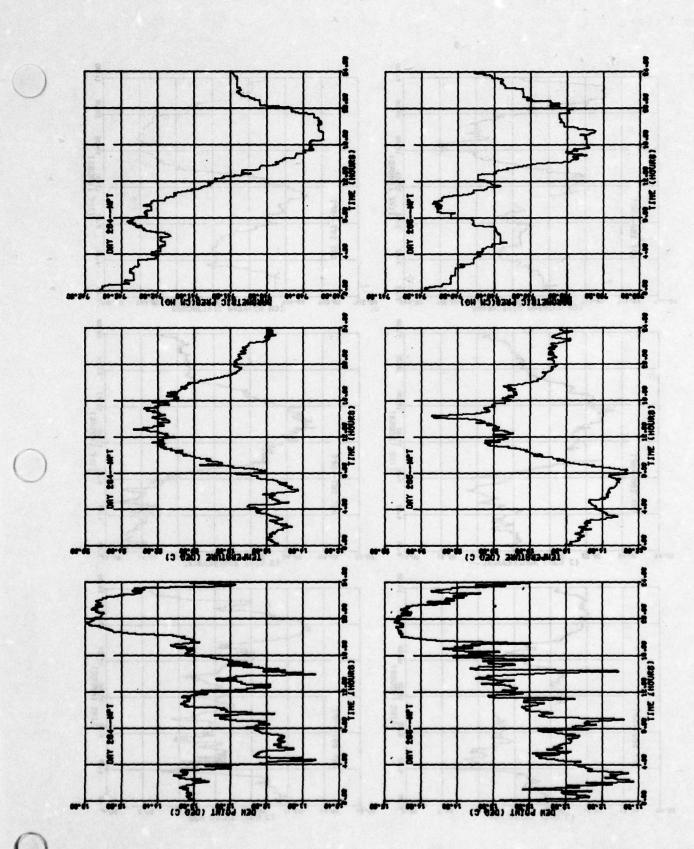


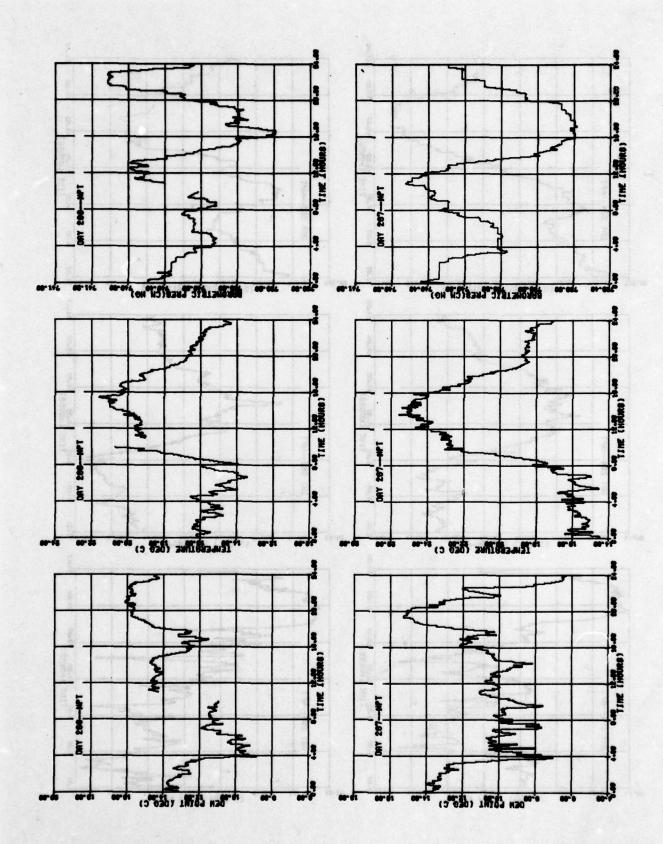


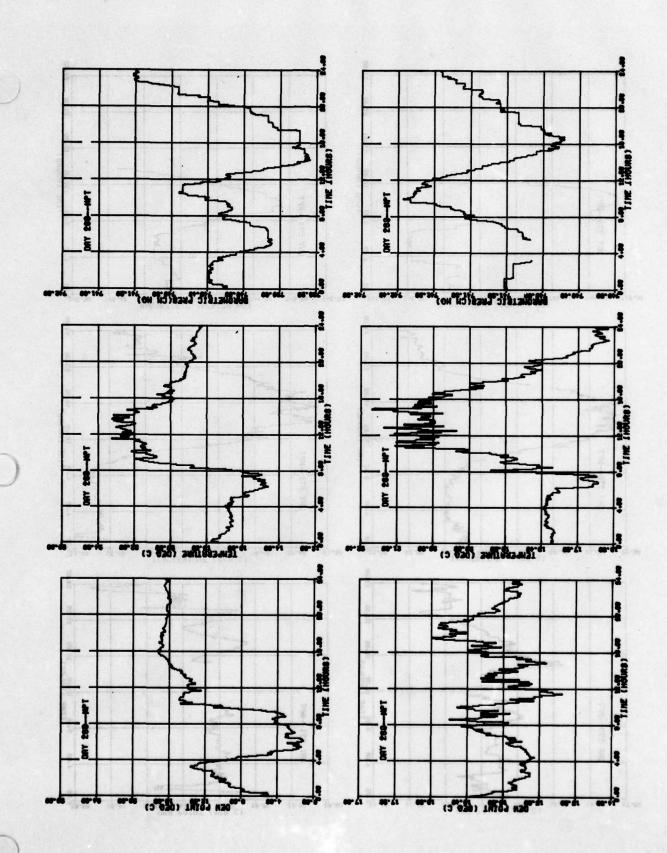


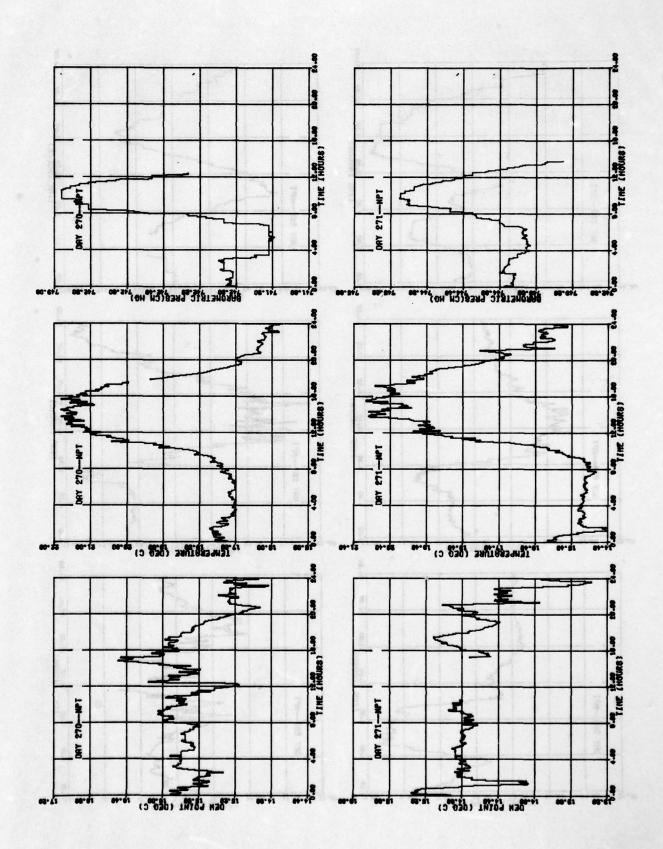


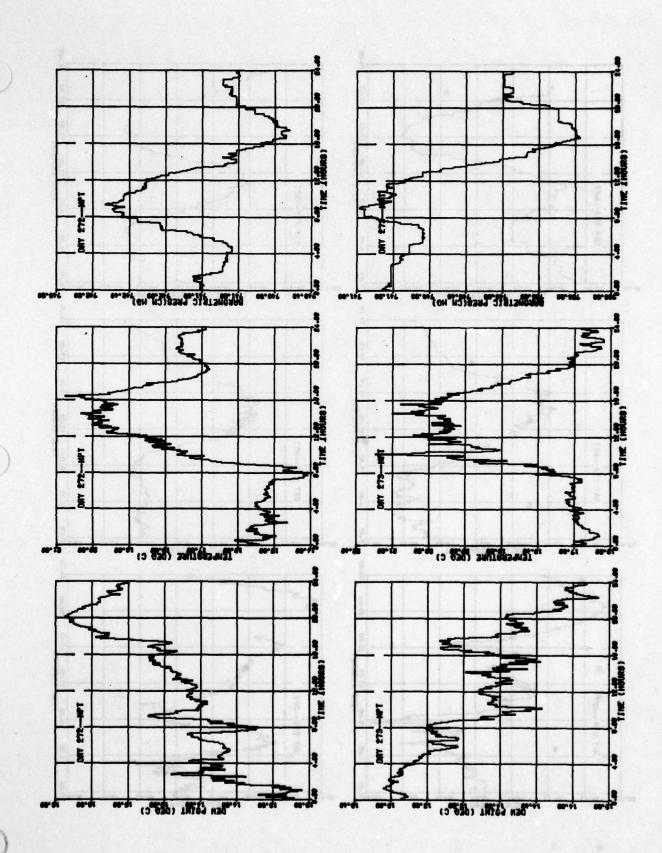


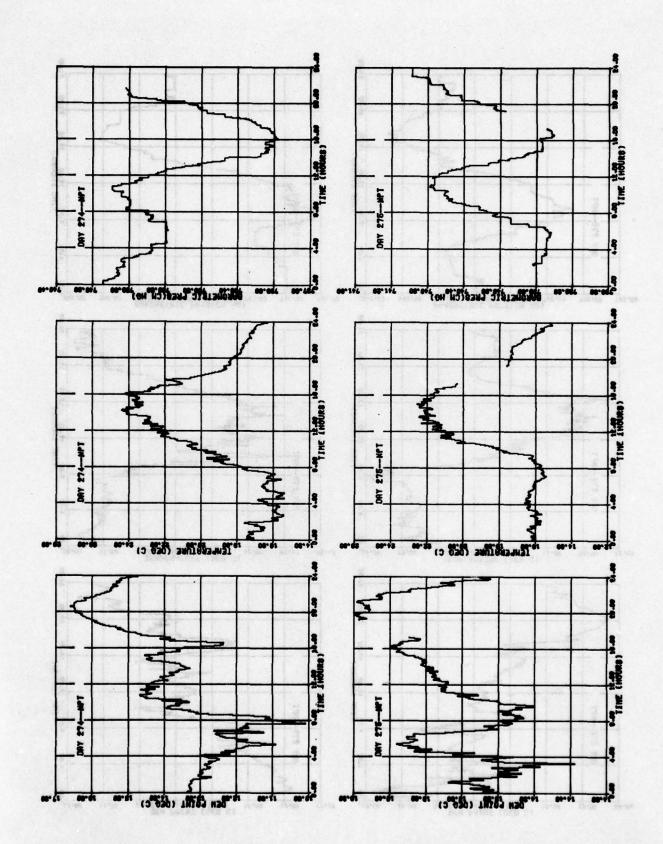


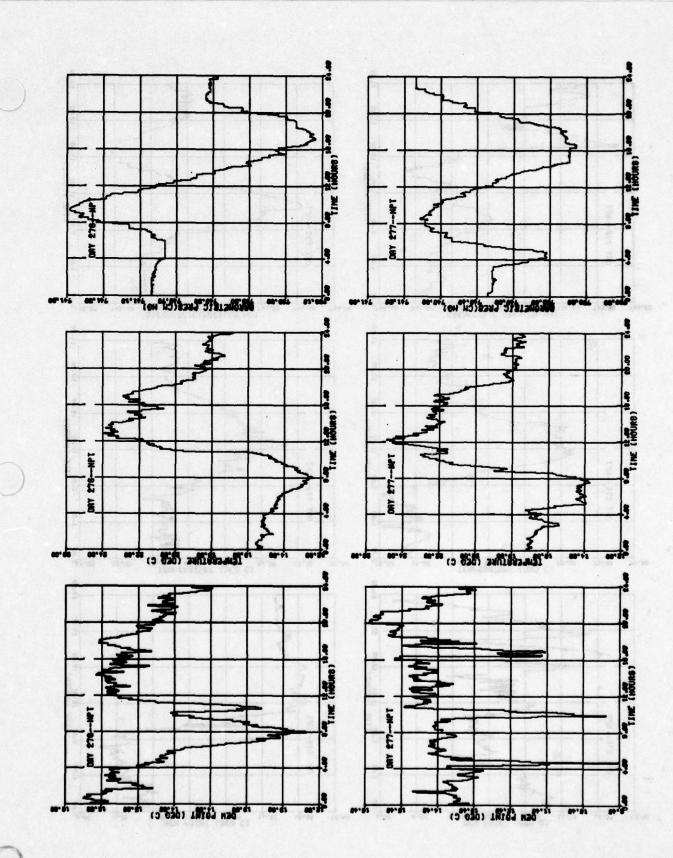


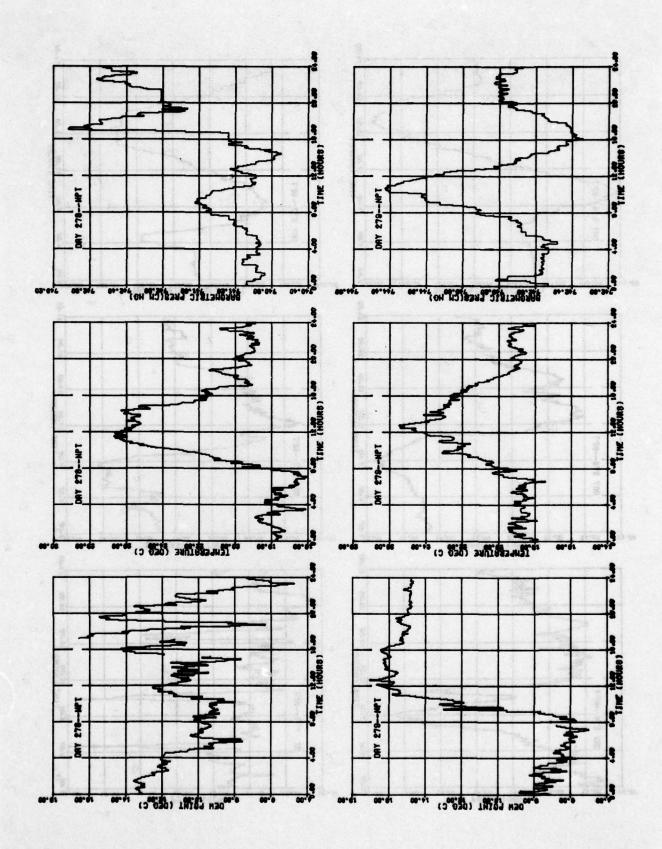


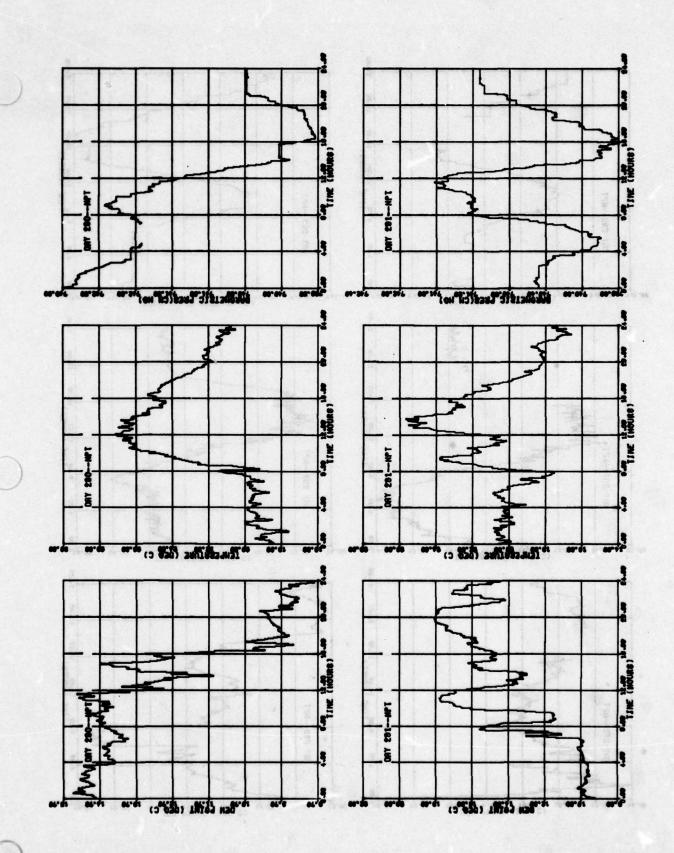


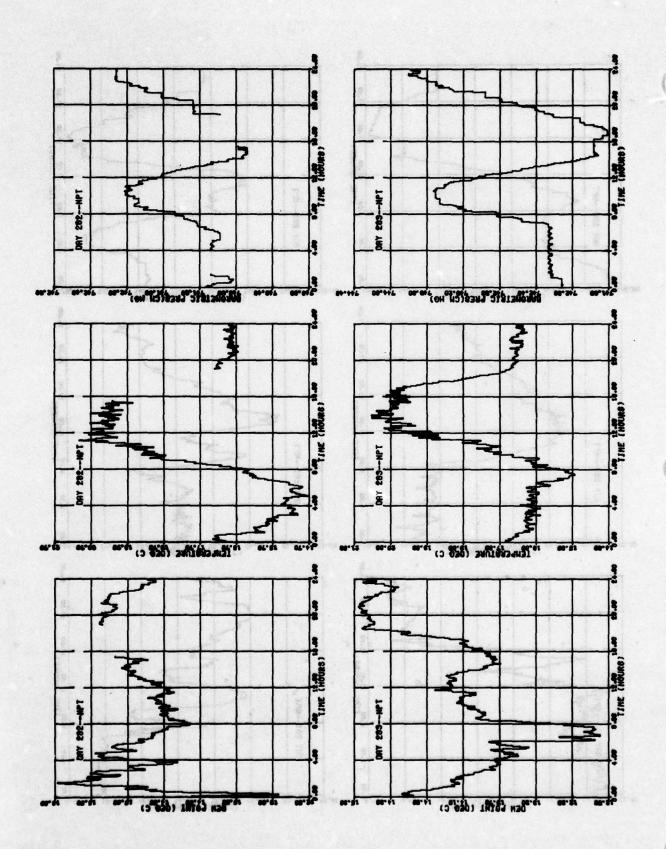


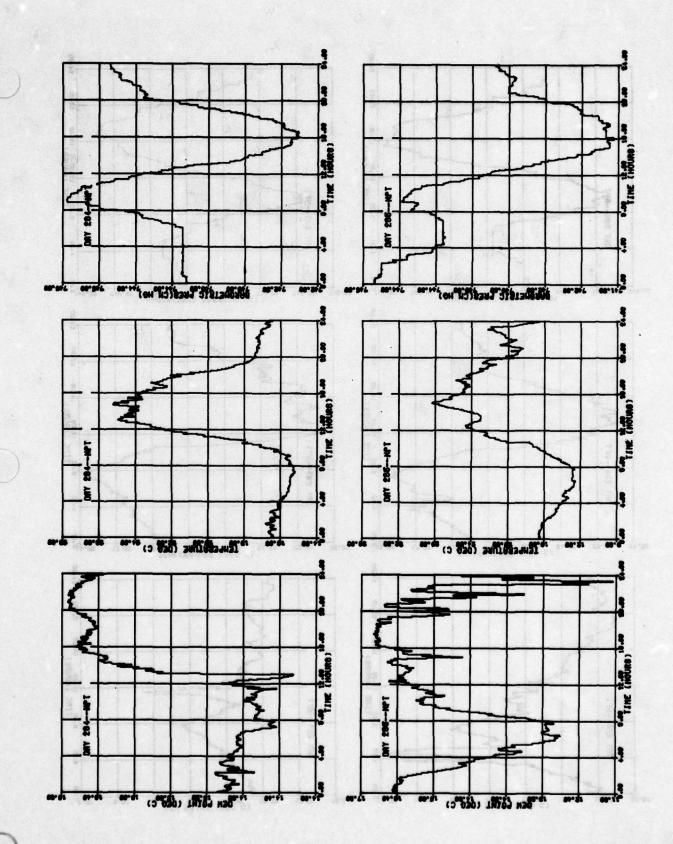


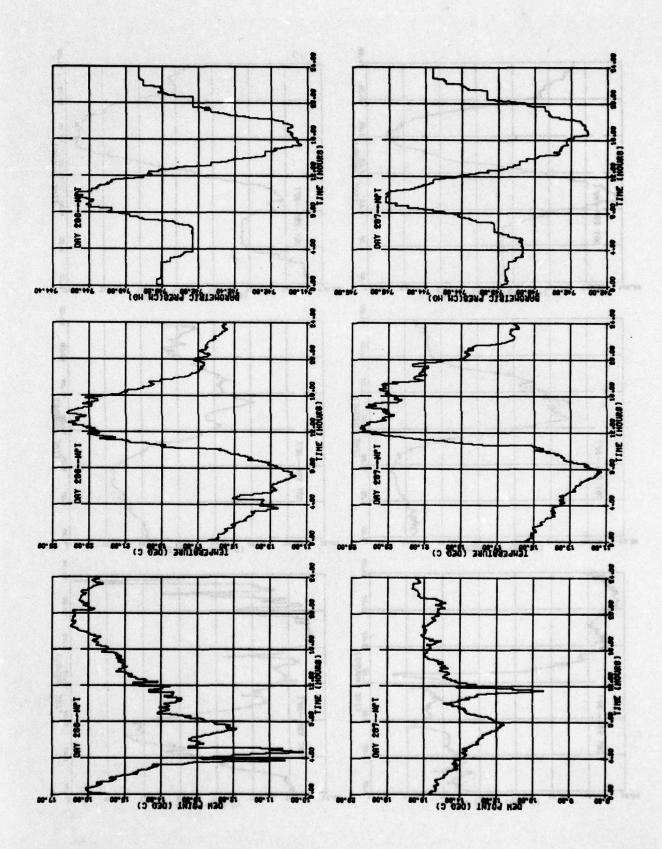


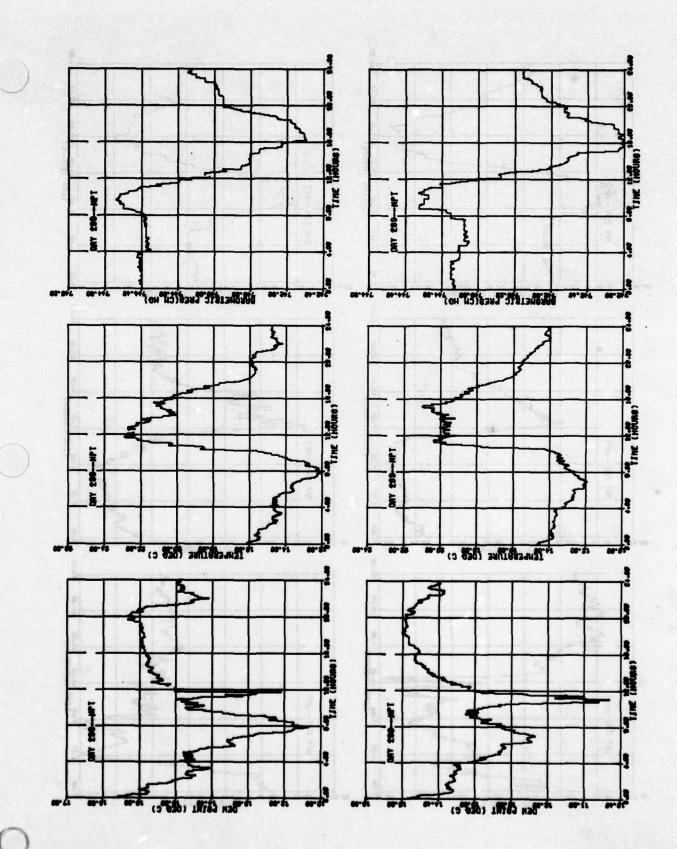


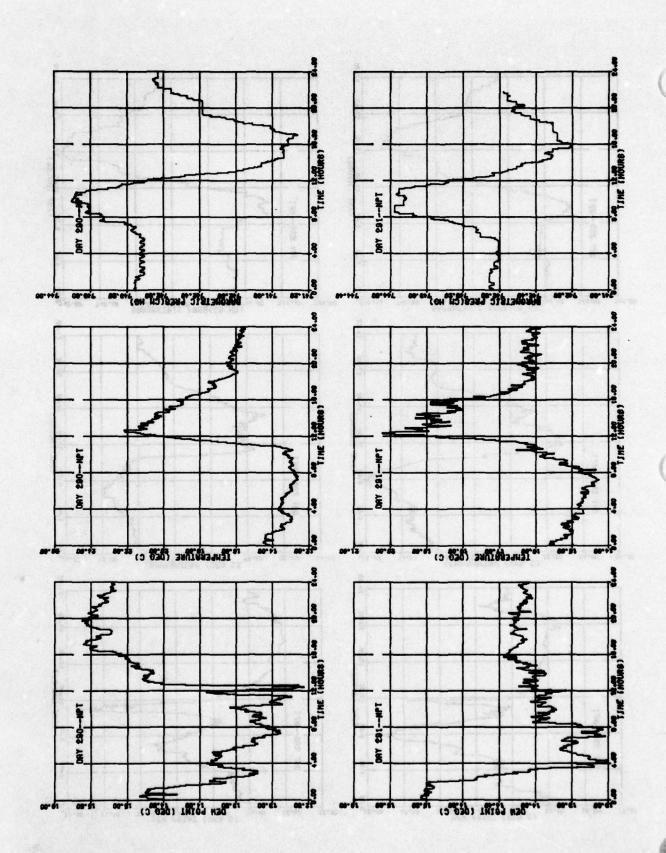


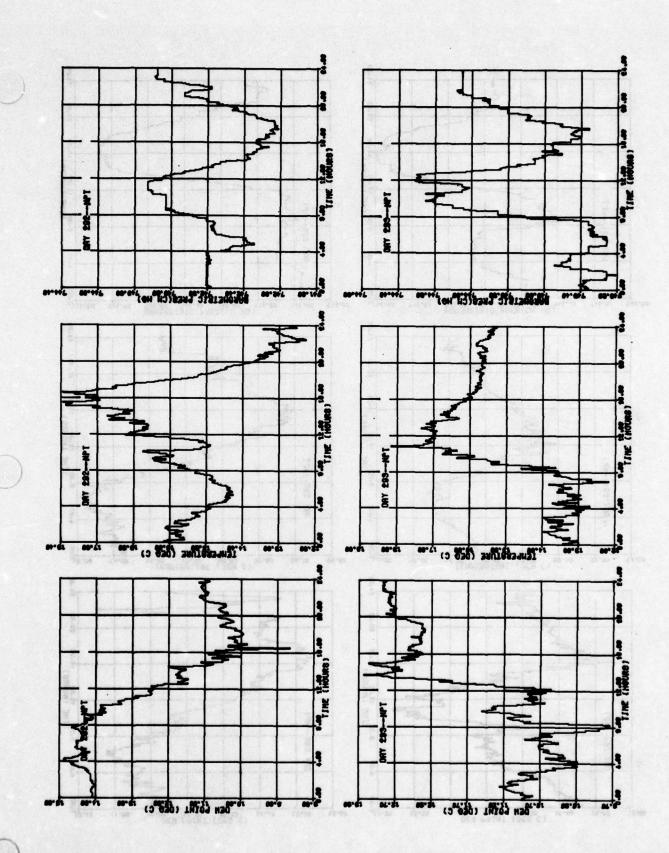


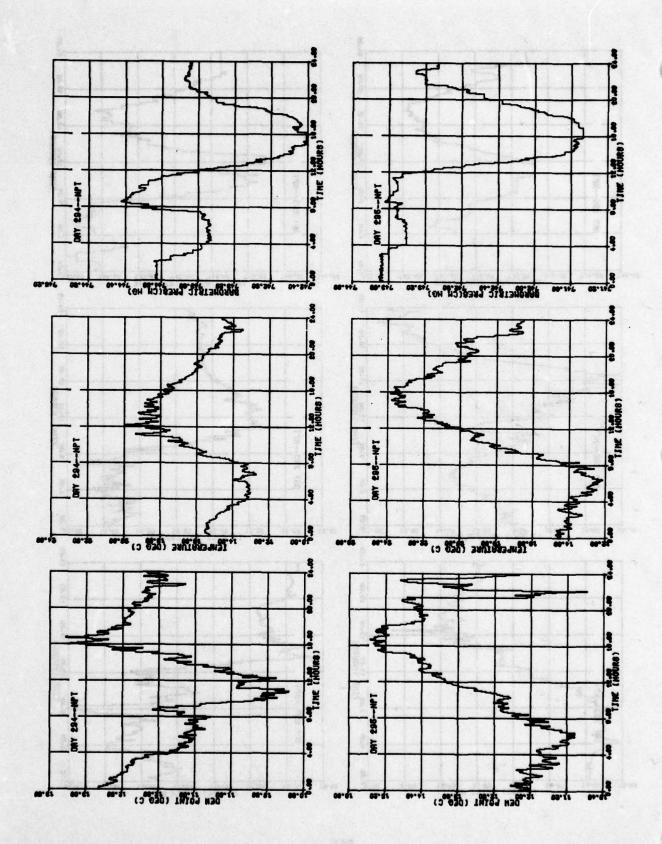


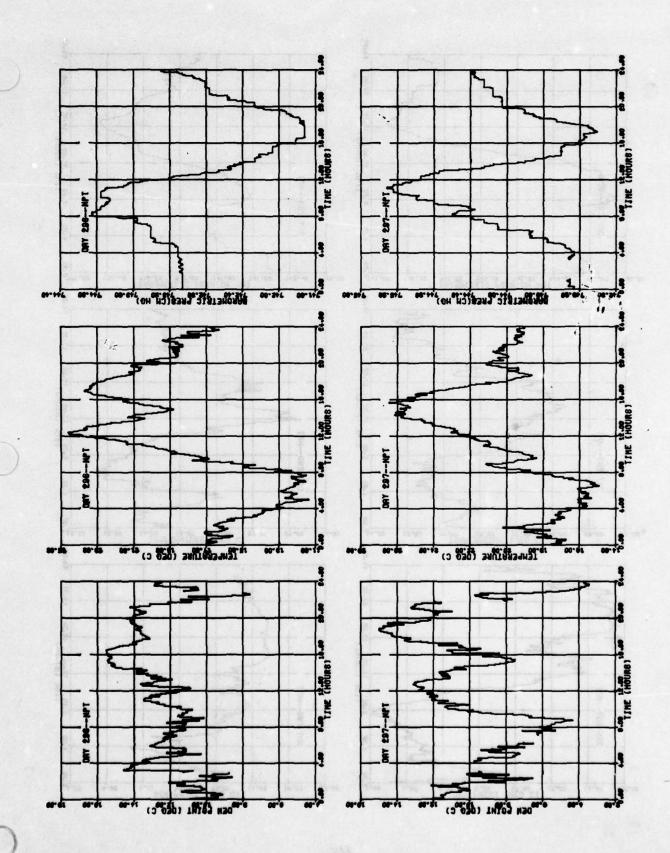


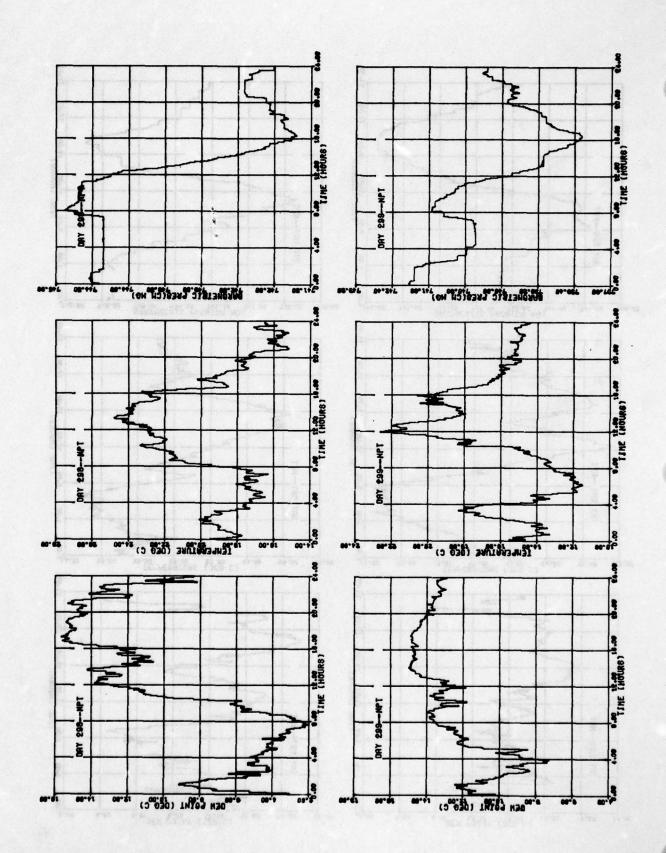


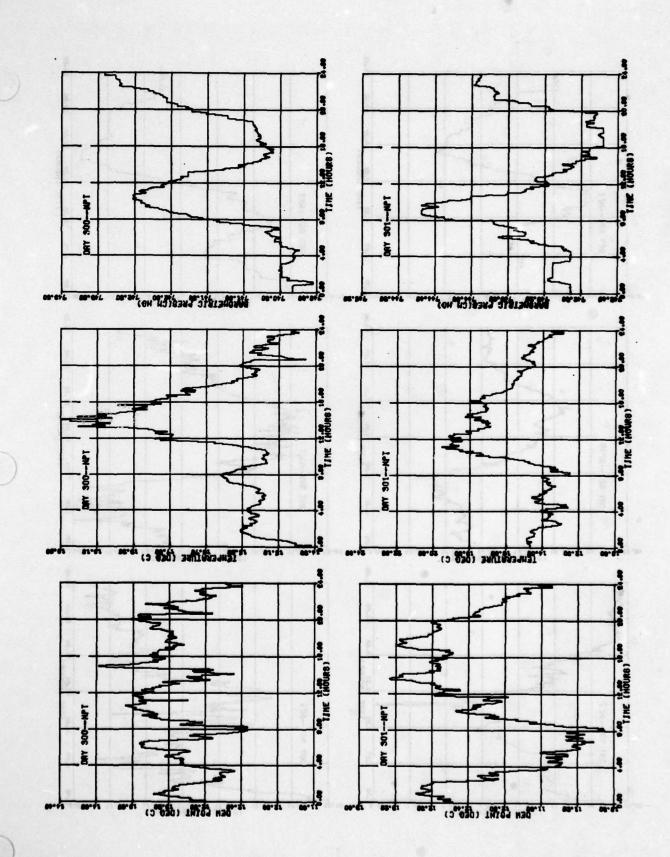


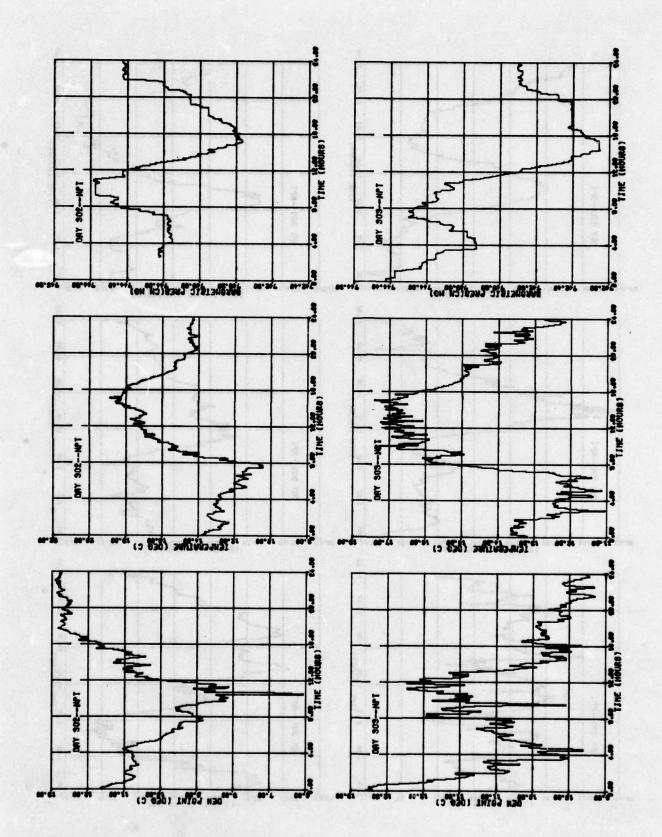


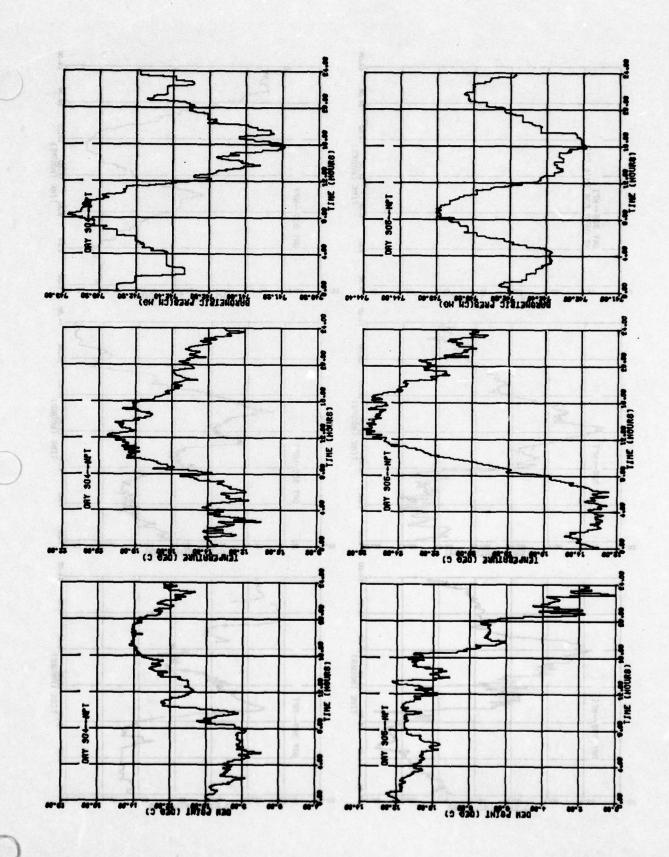


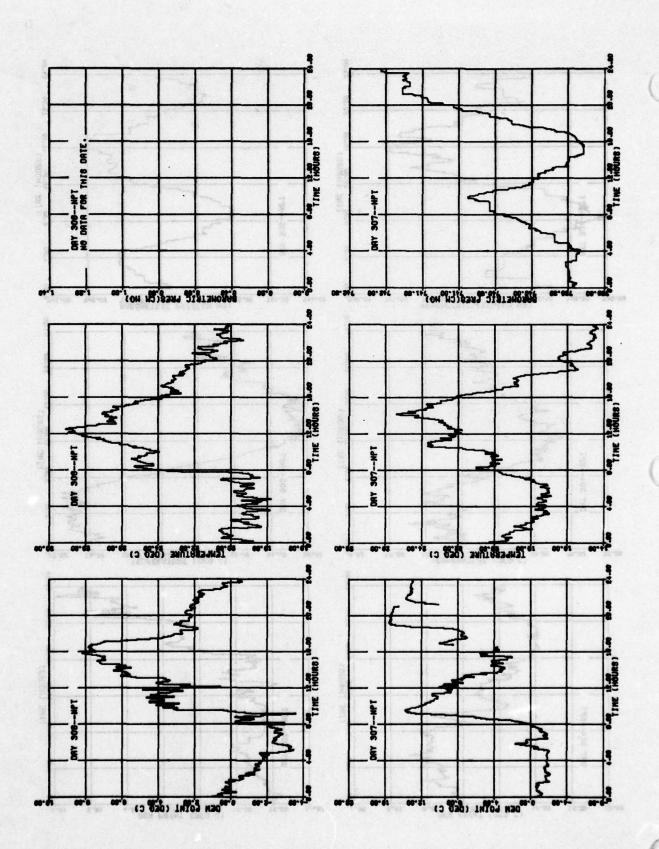


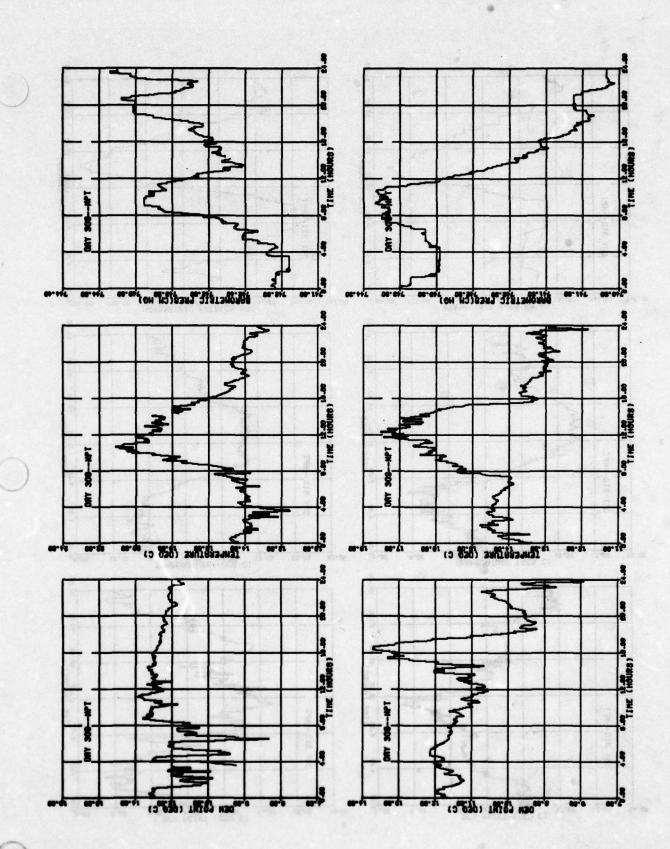


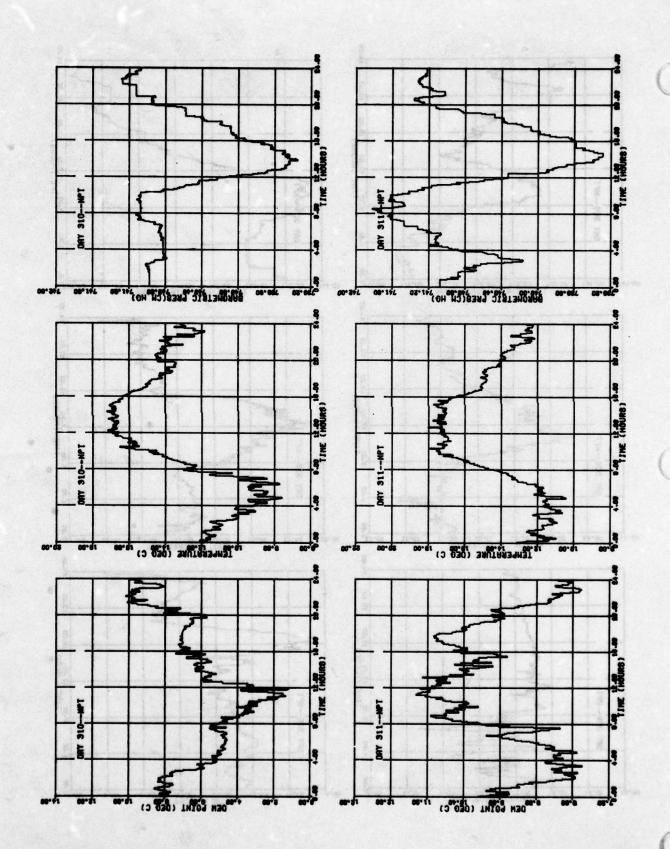


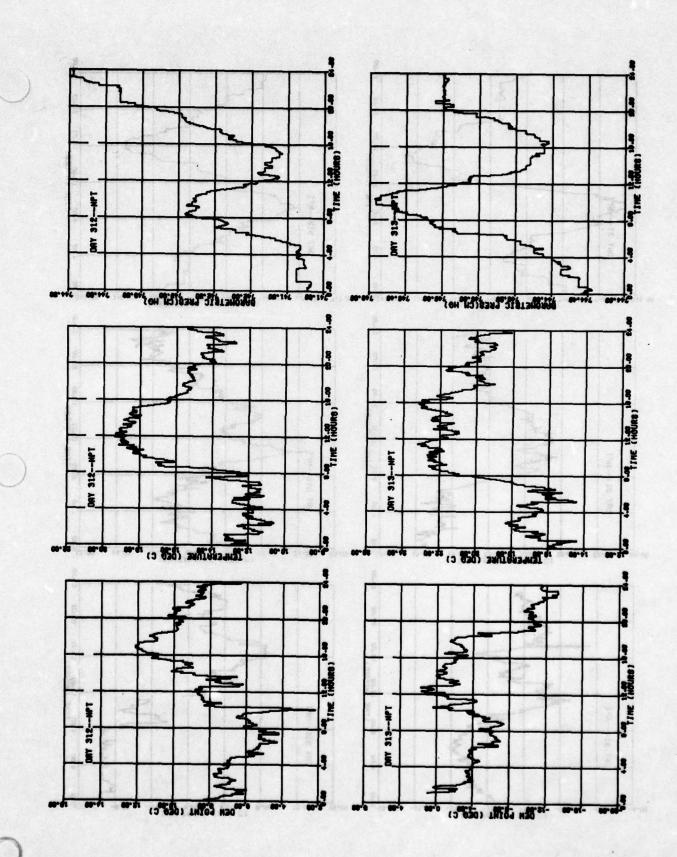


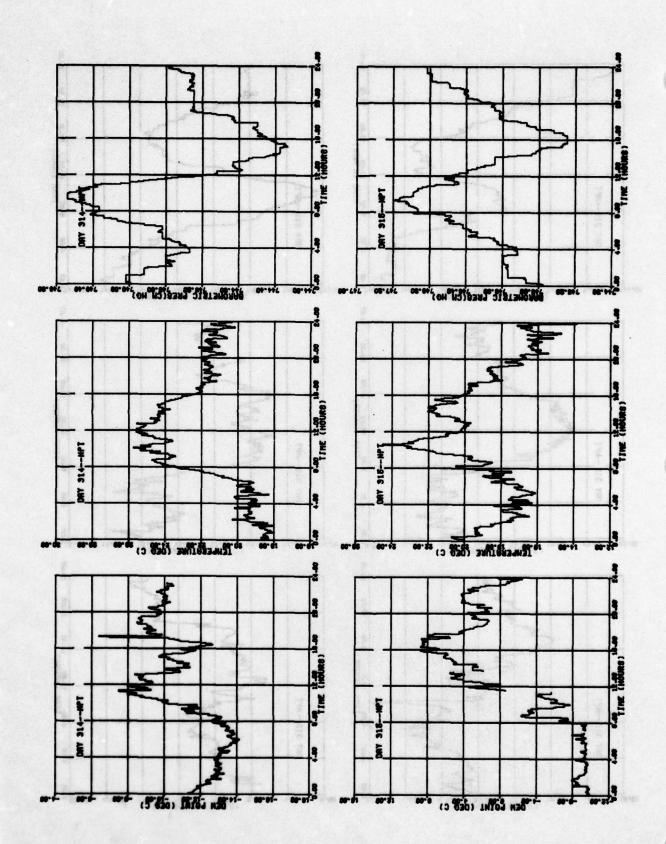


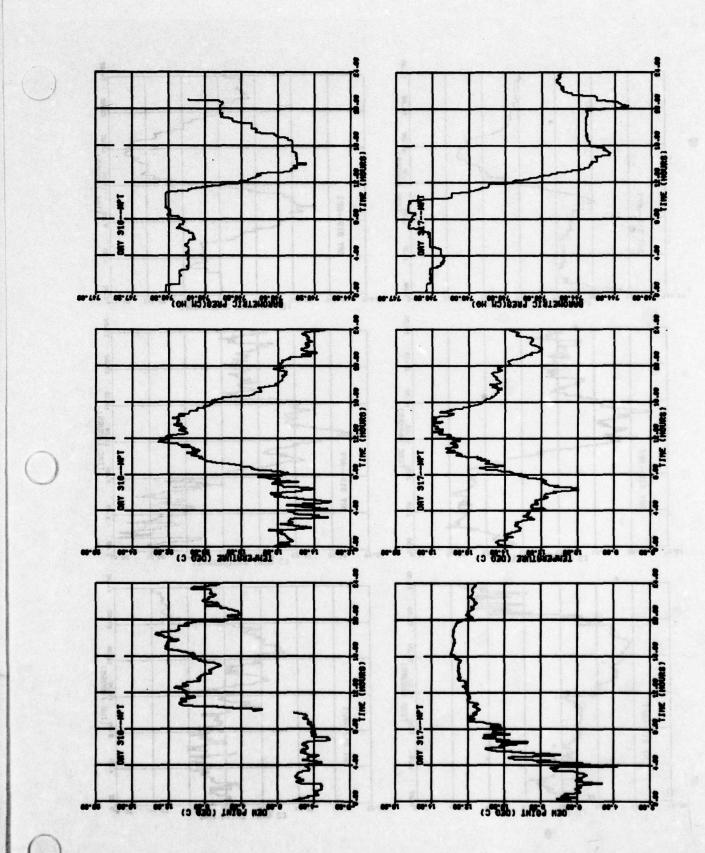


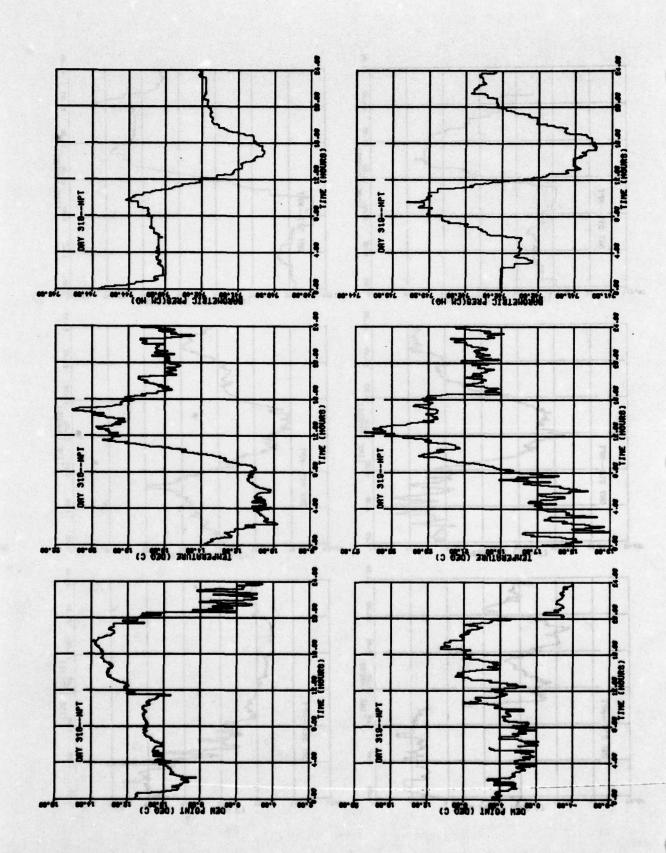


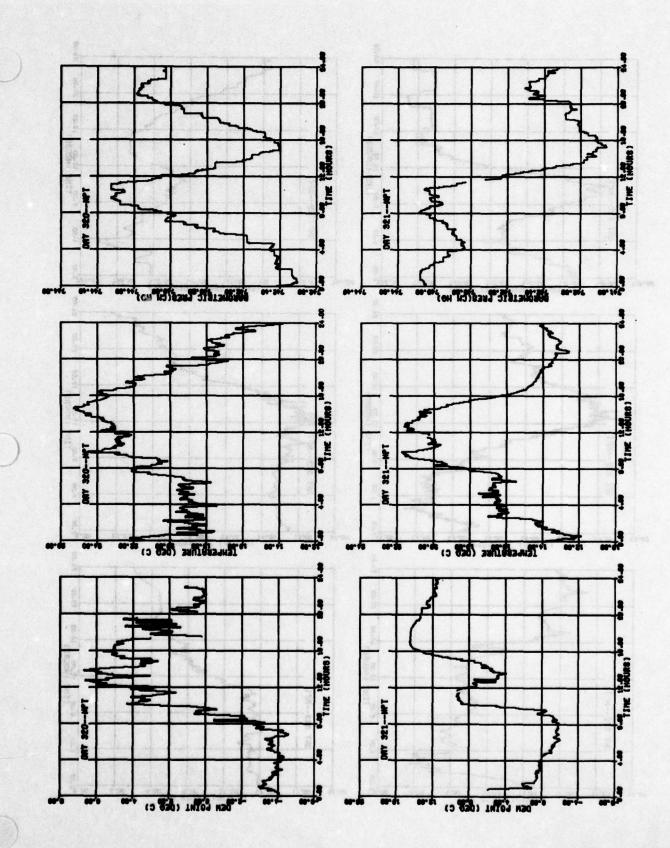


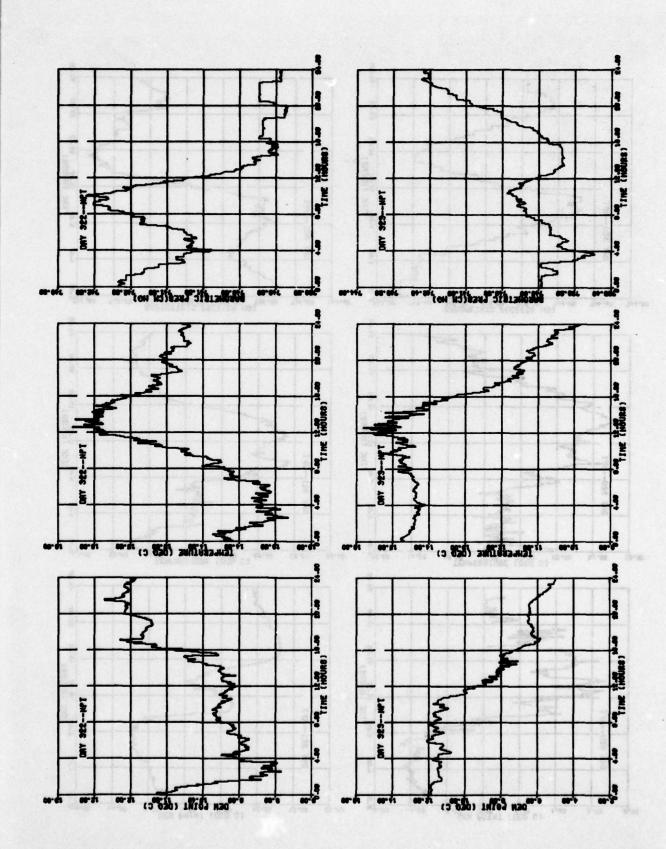


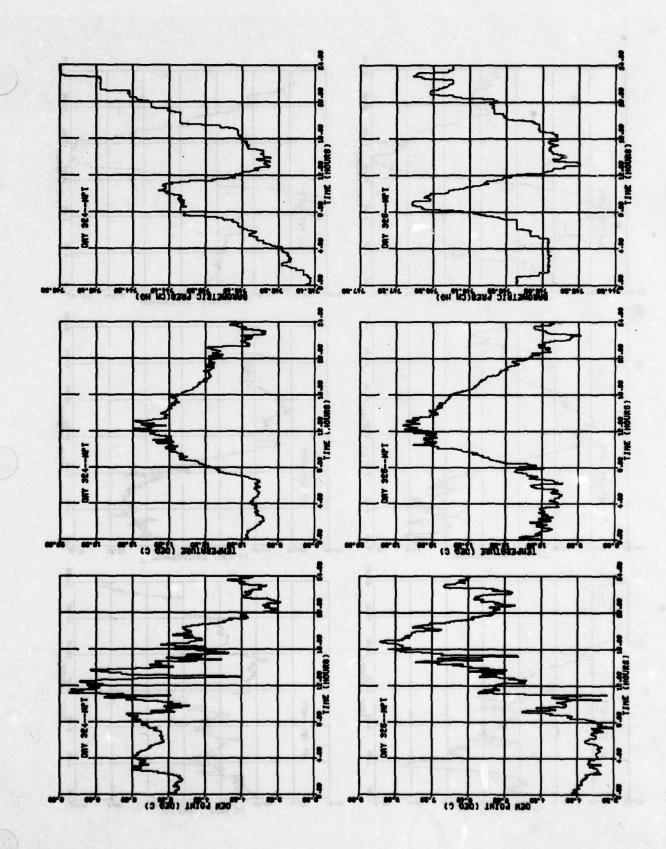


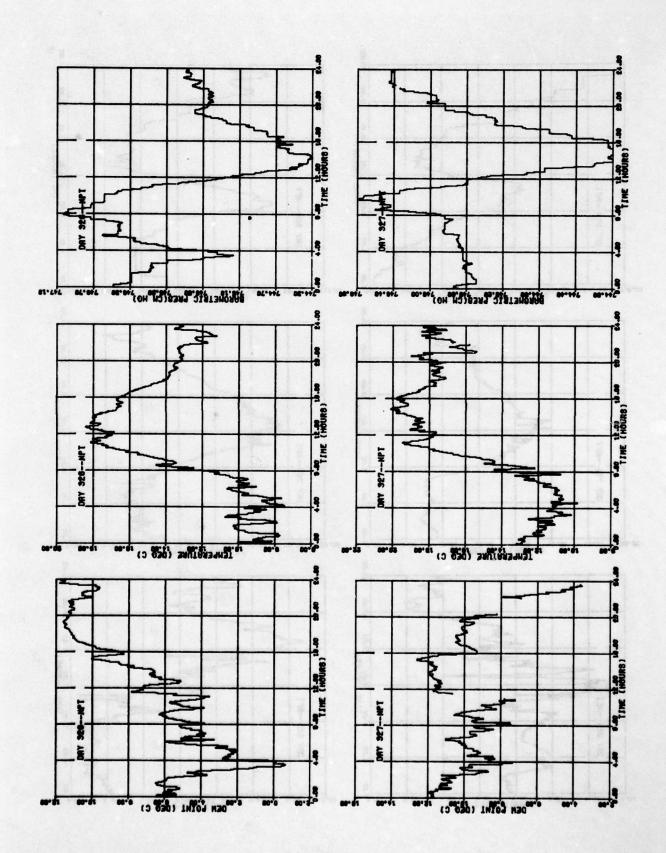


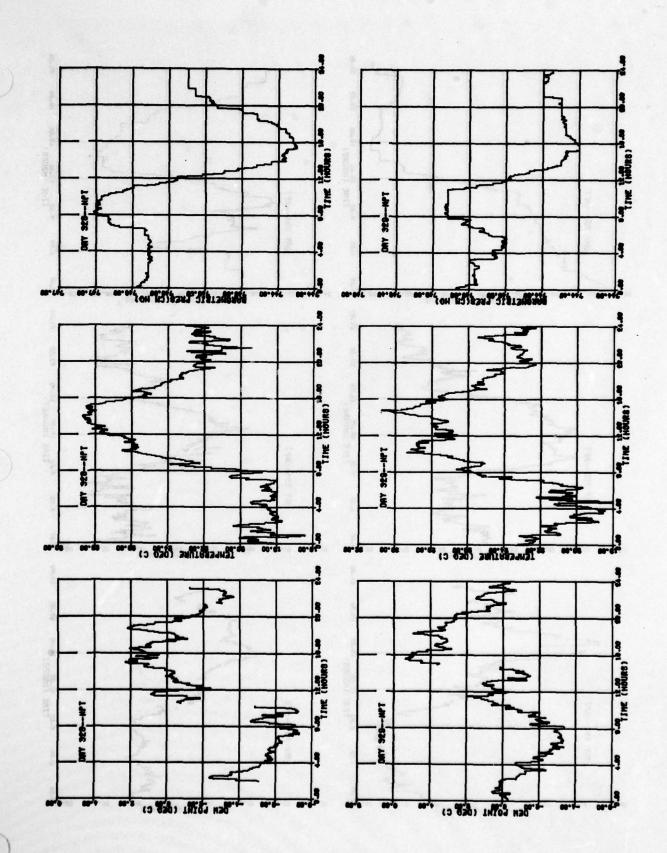


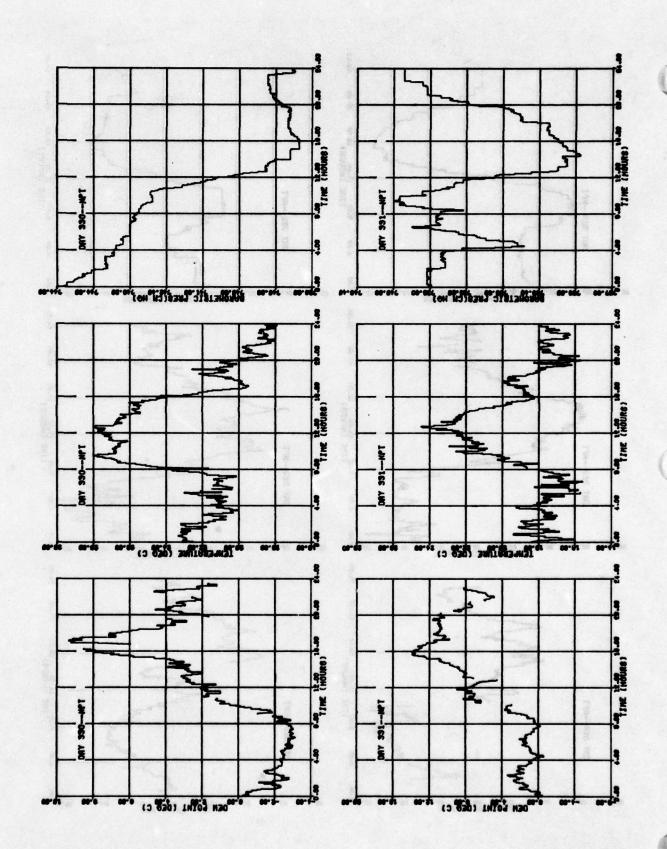


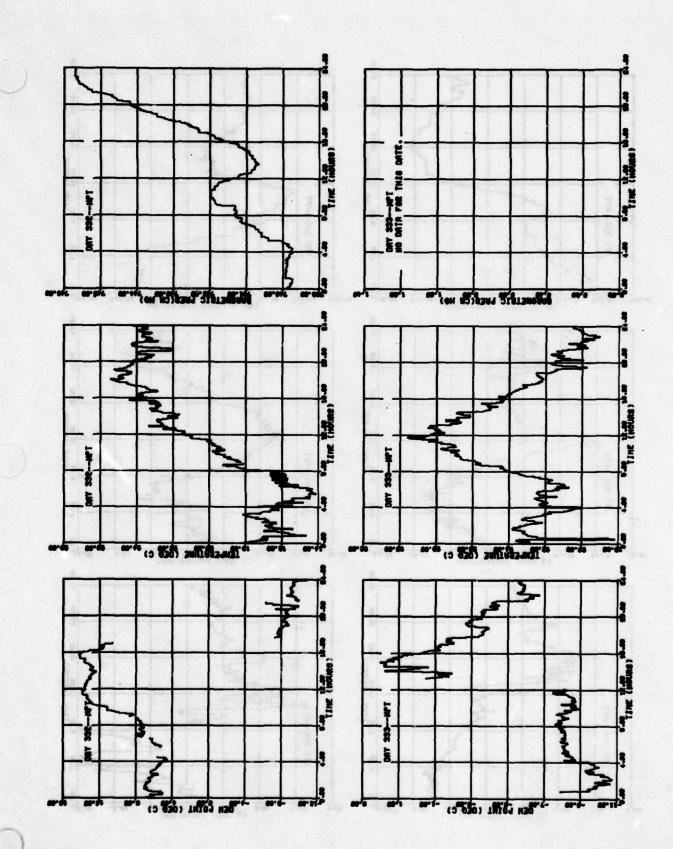


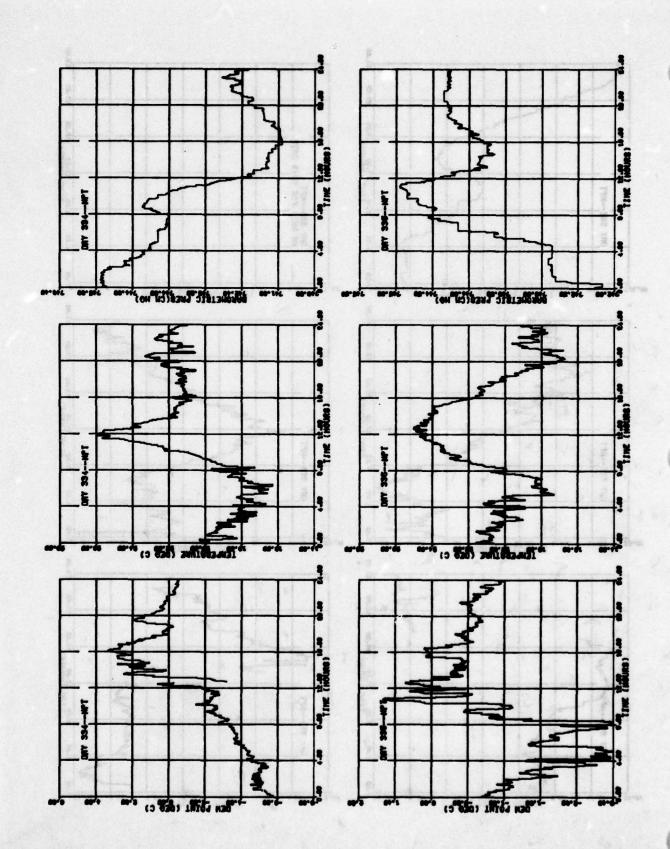


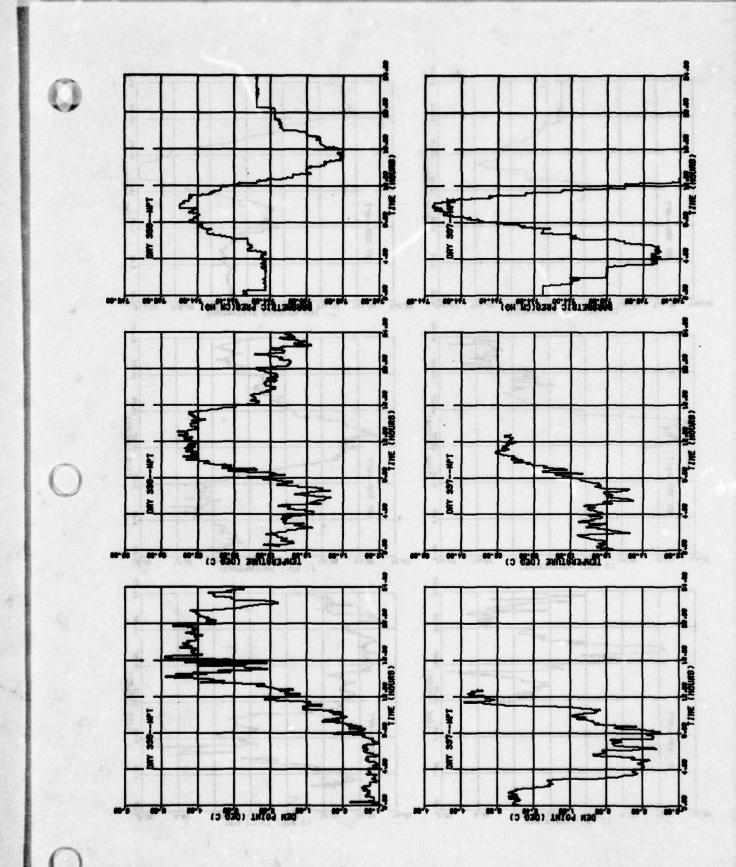


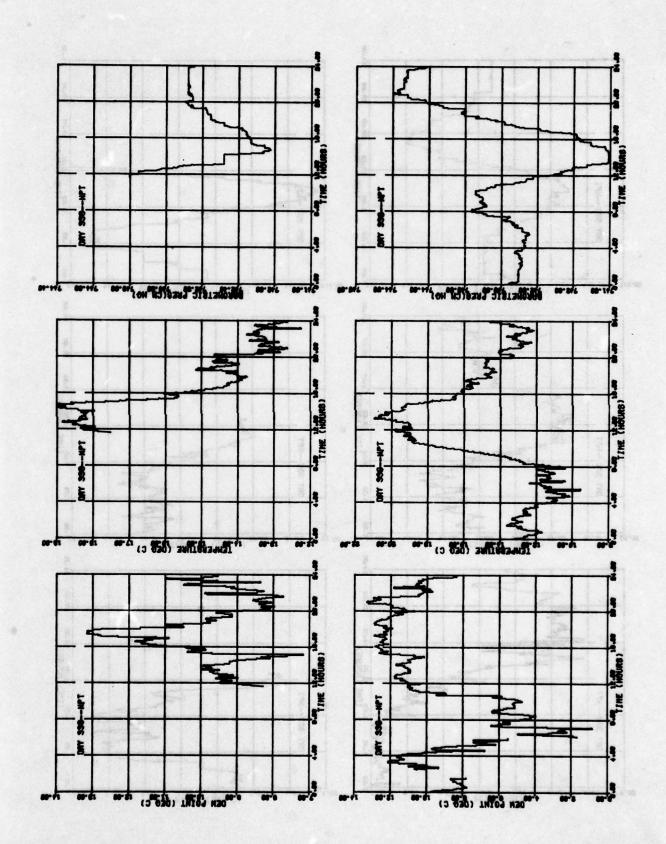


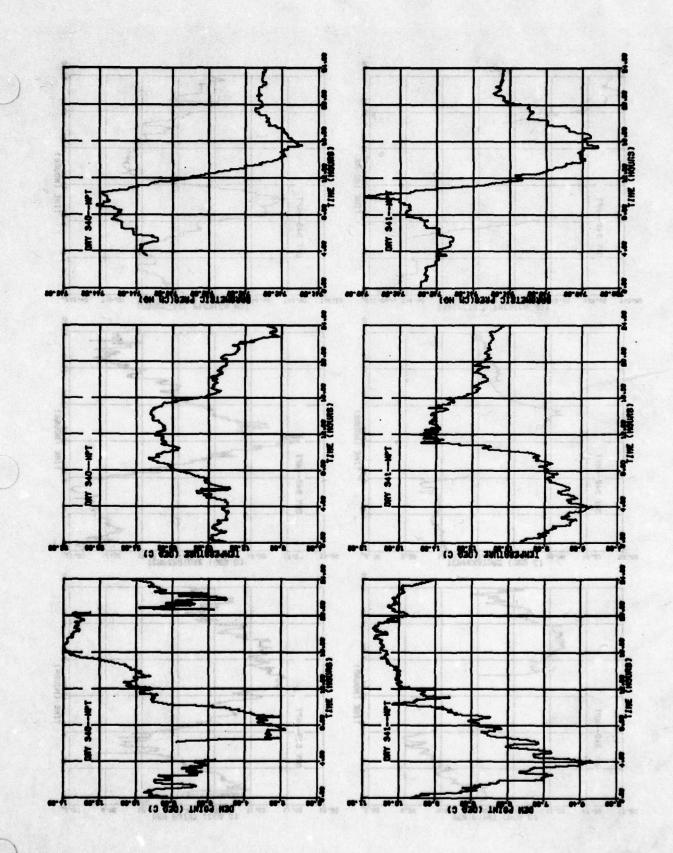


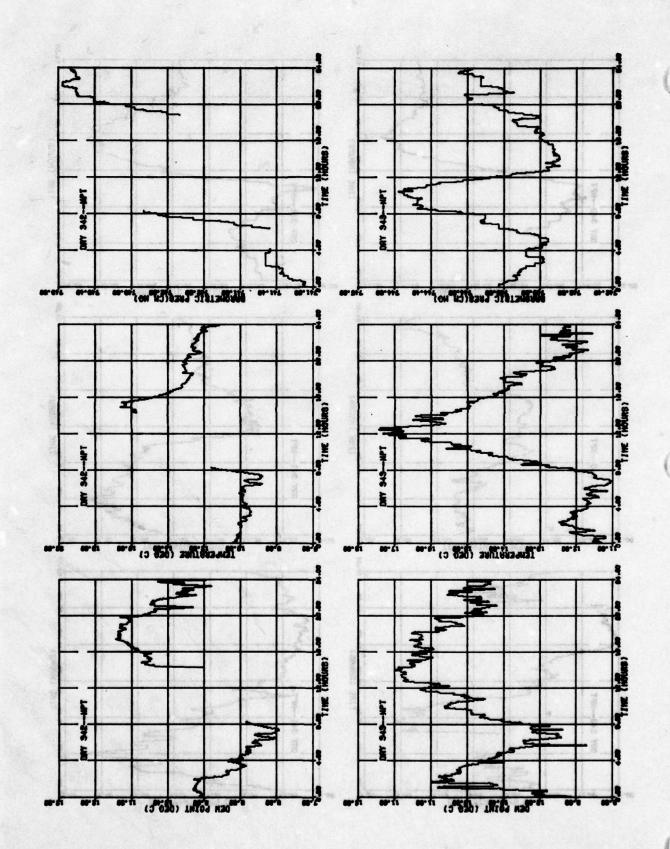


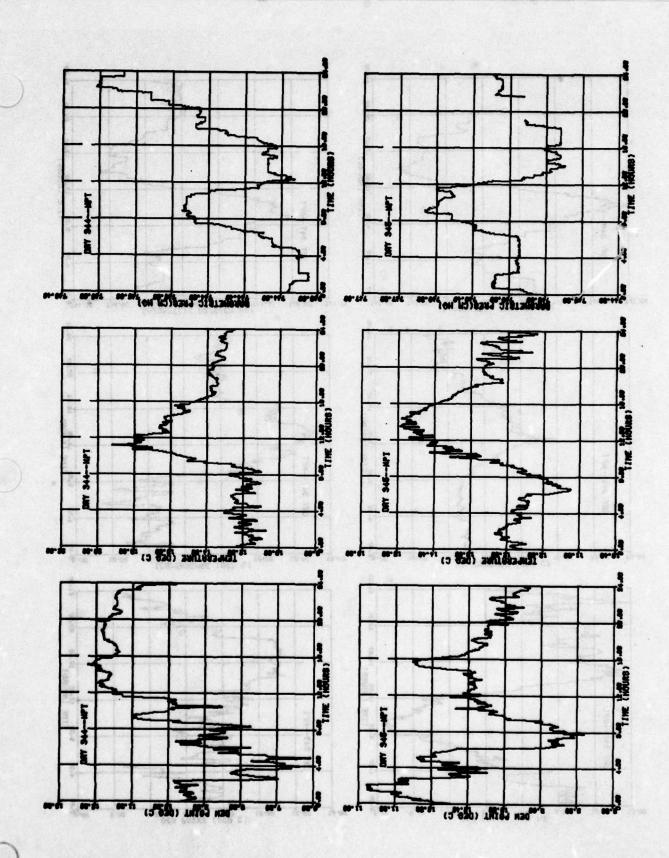


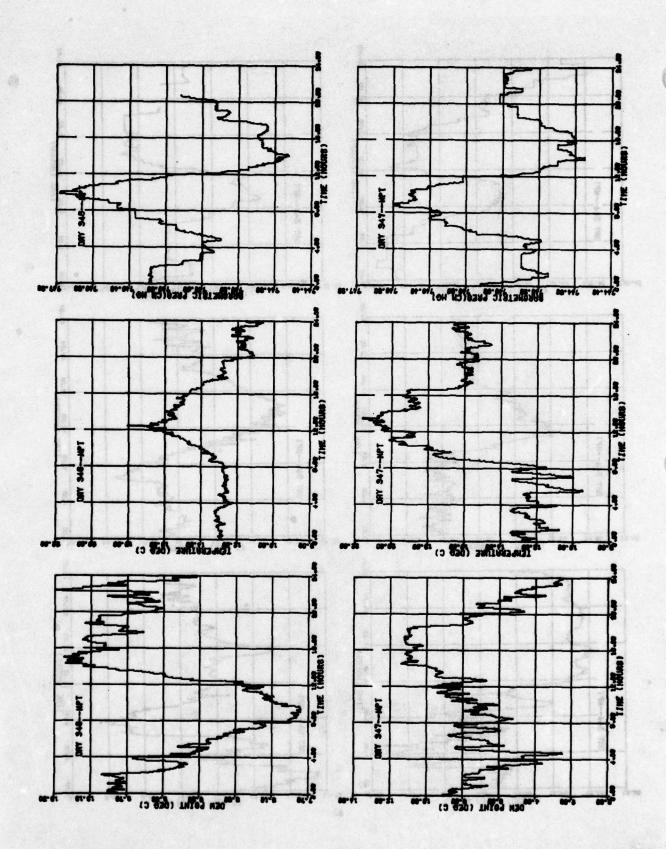


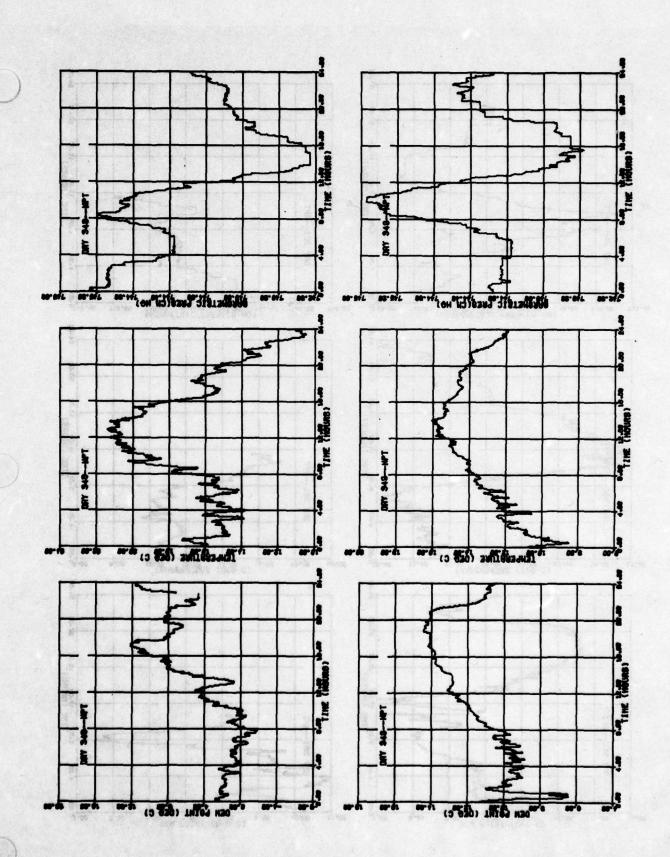


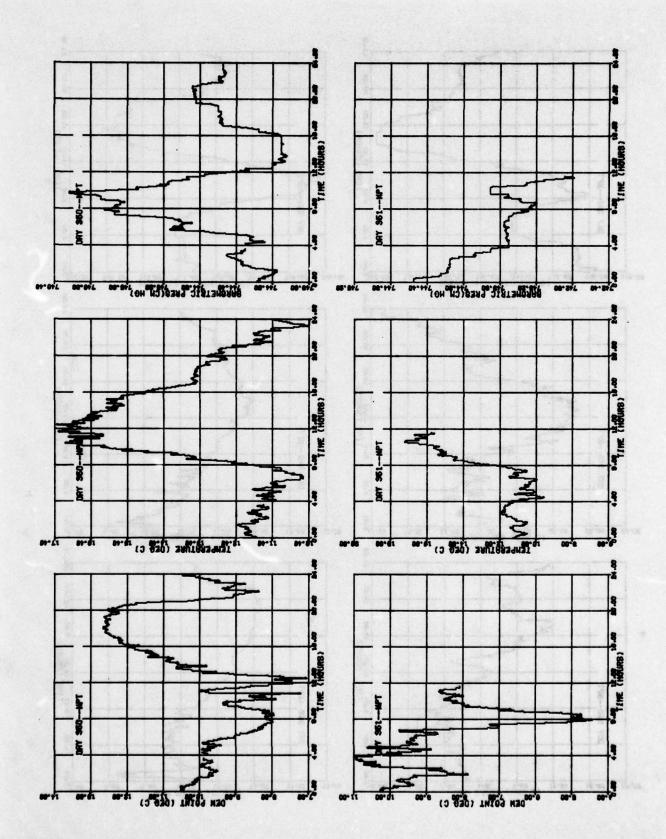












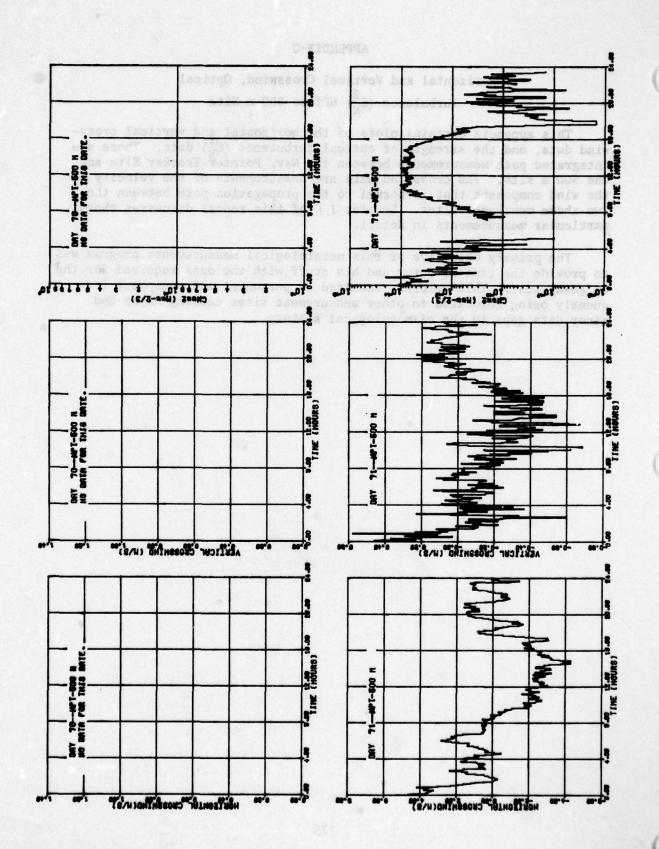
APPENDIX C

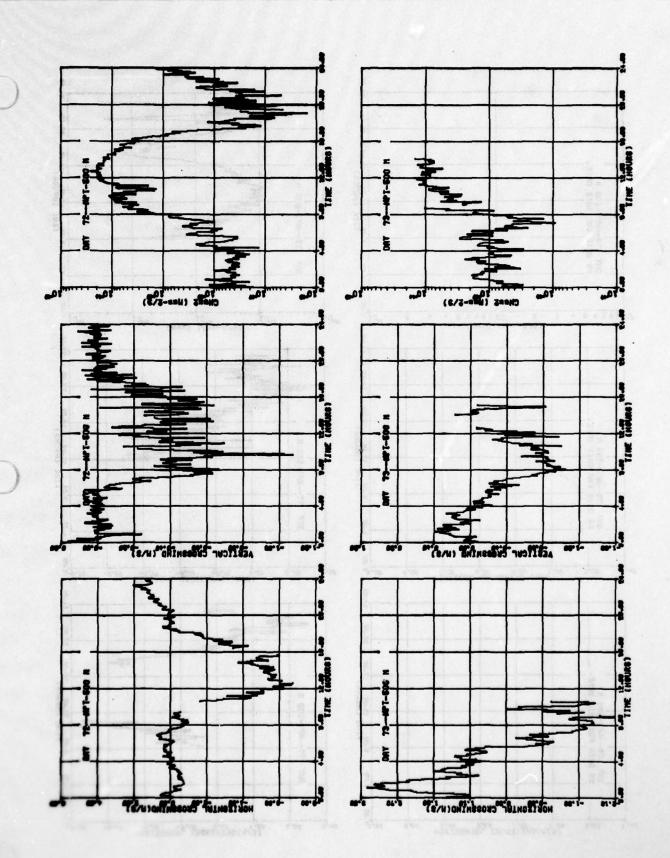
Horizontal and Vertical Crosswind, Optical Turbulence (C_N^2) NPT to 500 m Site

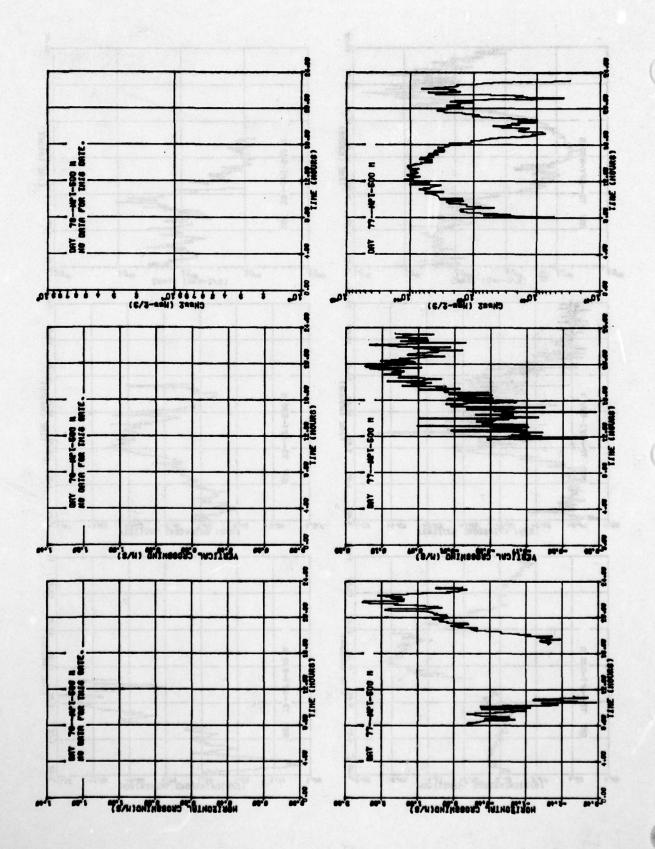
This appendix contains plots of the horizontal and vertical crosswind data, and the strength of optical turbulence (C_N^2) data. These are integrated path measurements between the Navy Pointer-Tracker Site and the 500 m site. The crosswind data are measurements of the velocity of the wind component that is normal to the propagation path between the two above mentioned sites. Section I C of this report discusses these particular measurements in detail.

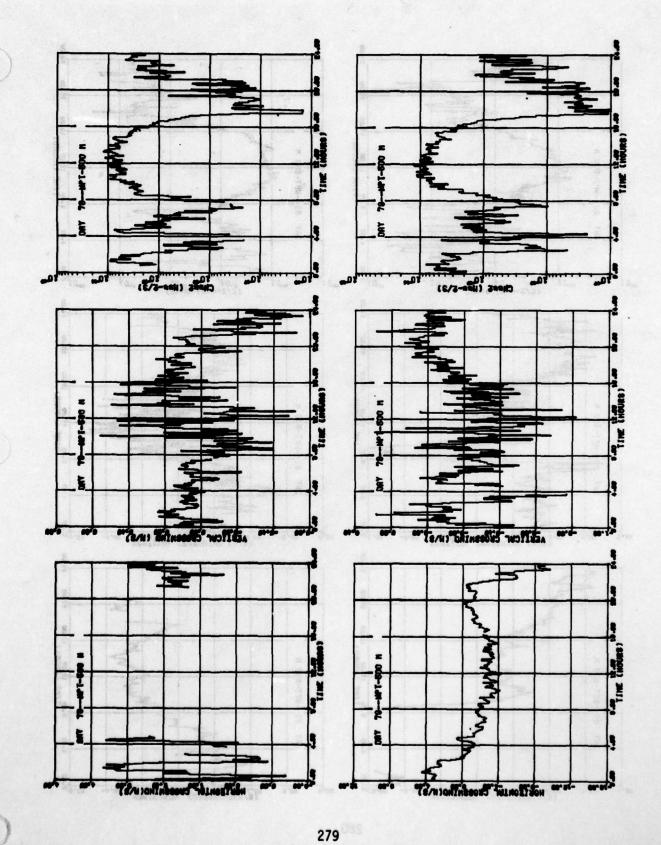
The primary objective of this meterological measurements program was to provide the test director and his staff with the data required for the on going test. This priority resulted in personnel and equipment frequently being relocated to other measurement sites causing major and minor data gaps in the climatological history.

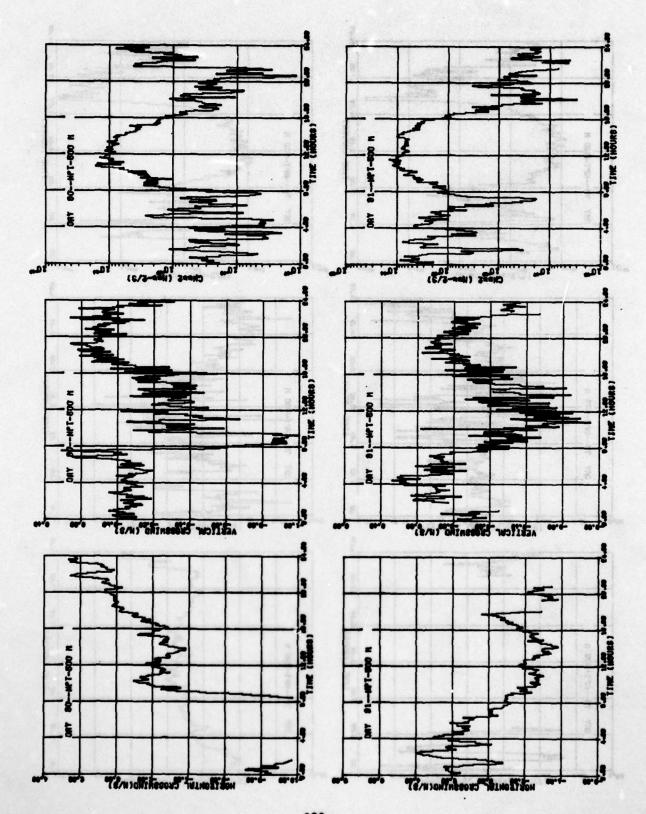
พละ (โลนาล์ "เพอธลักในและสา

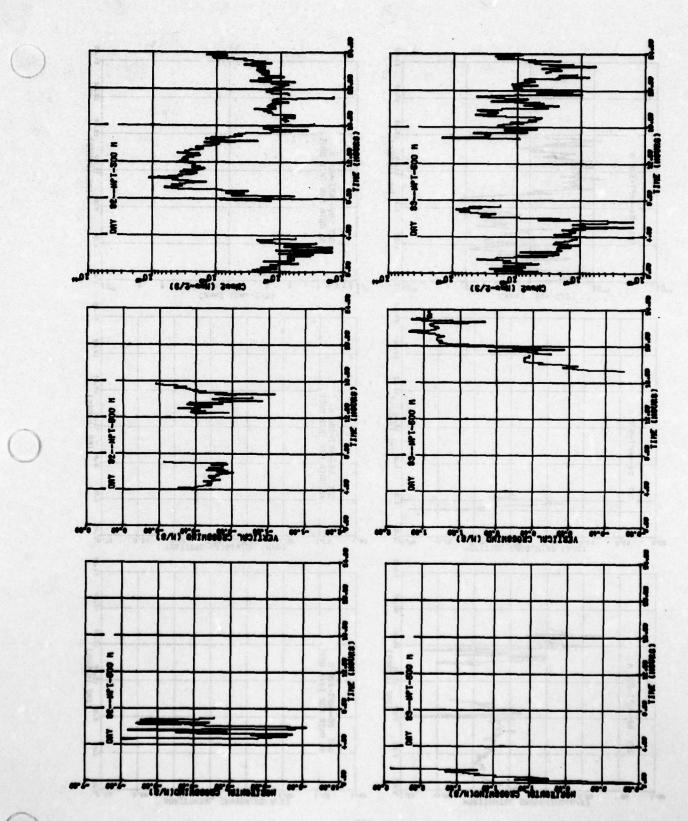


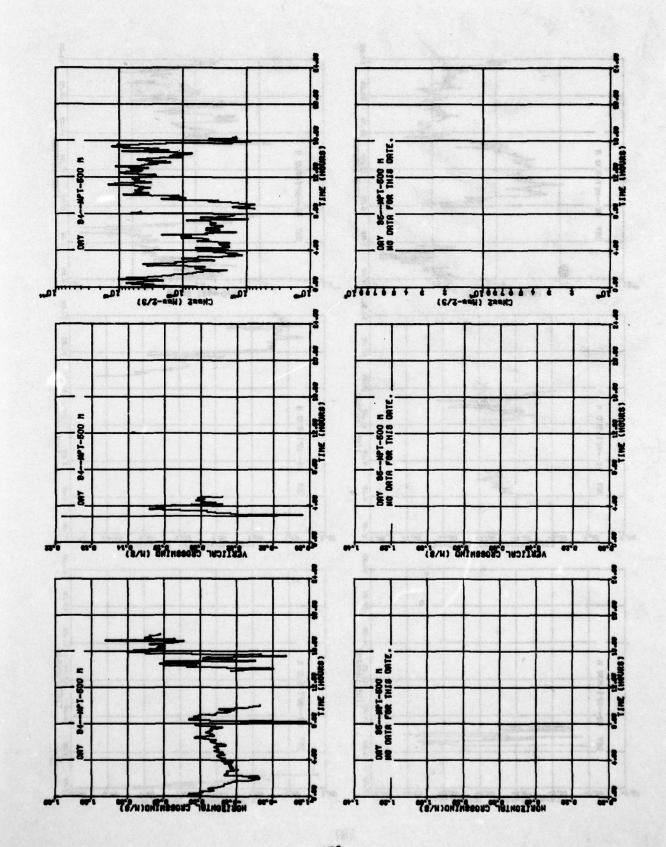


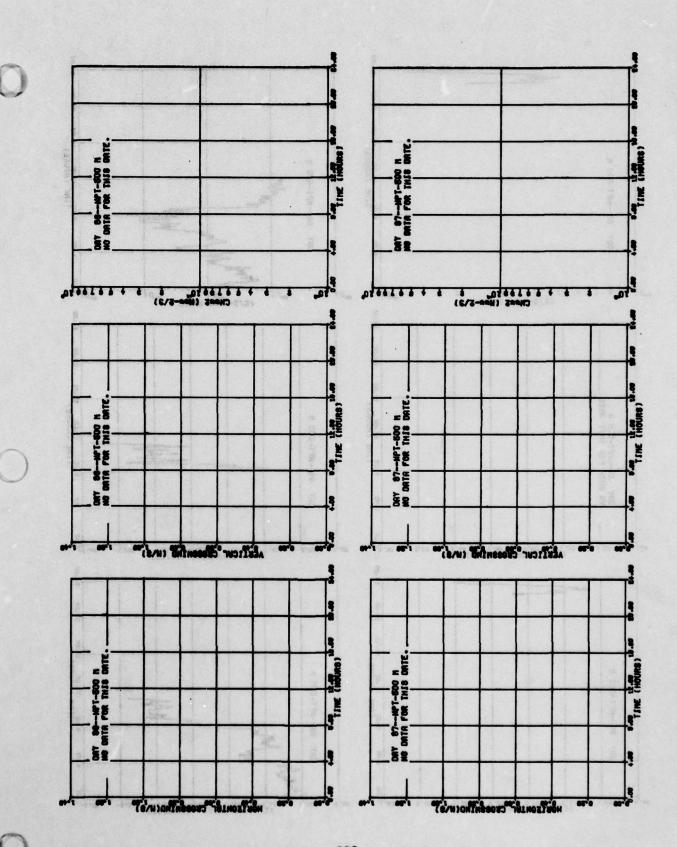


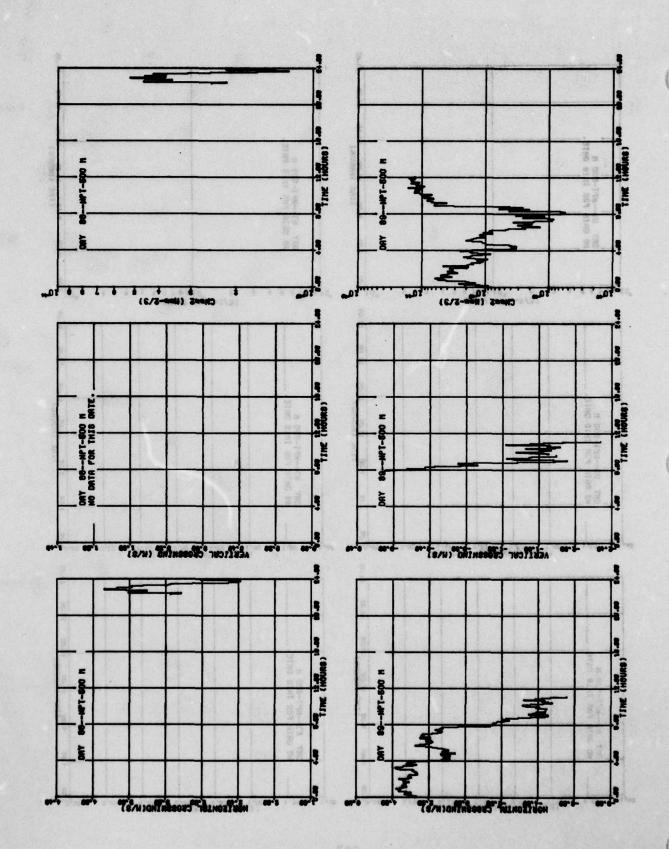


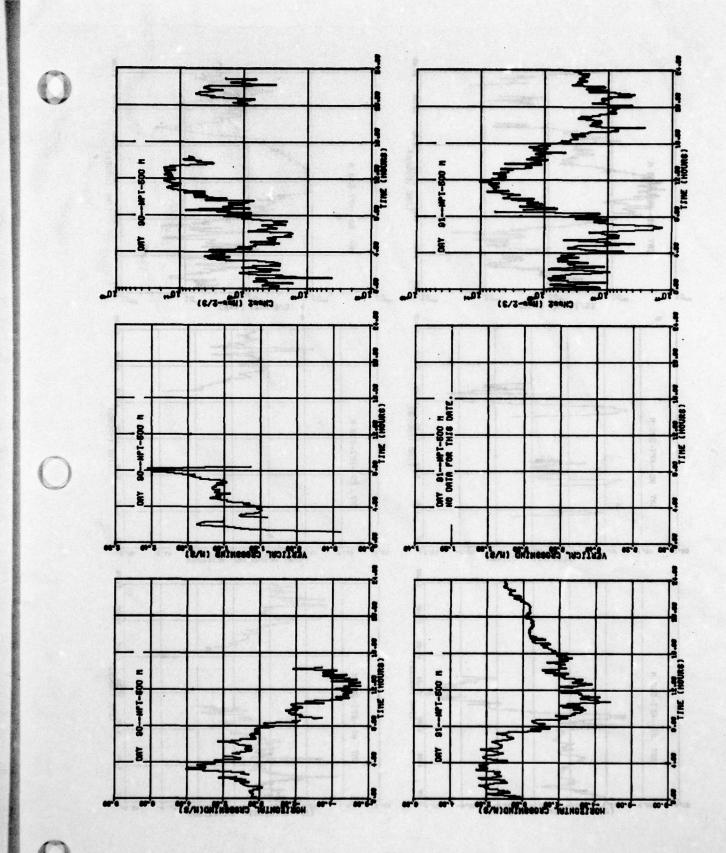


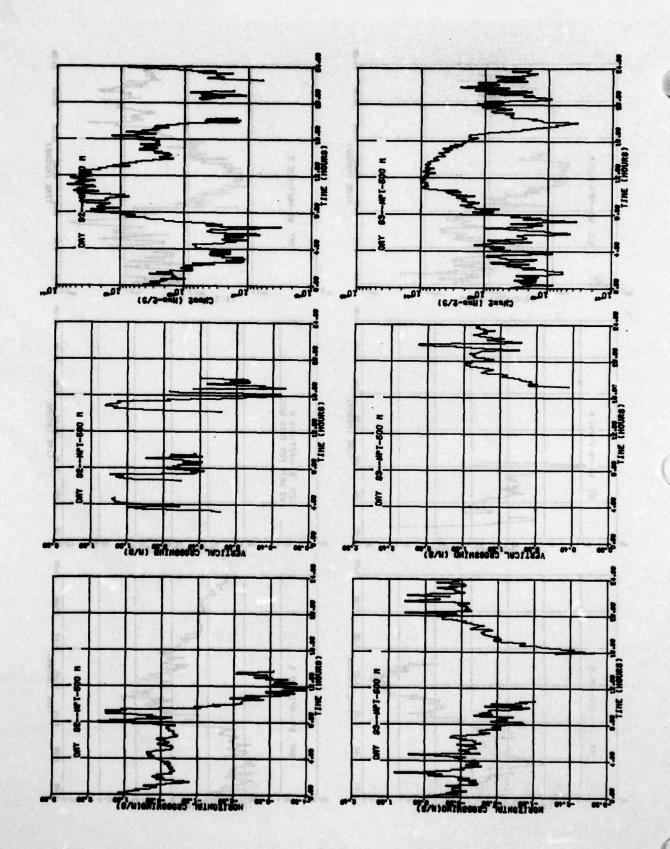


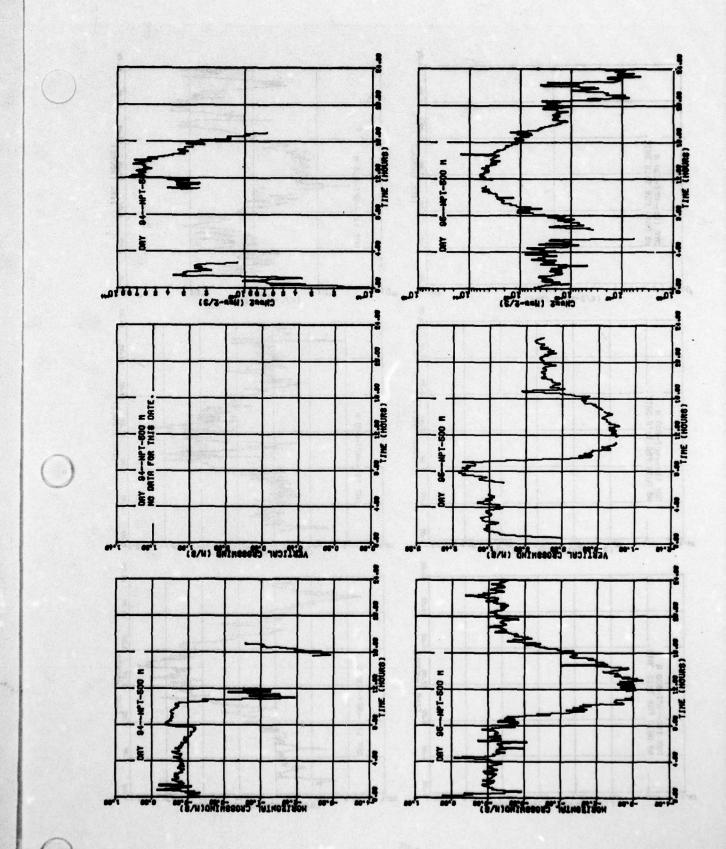


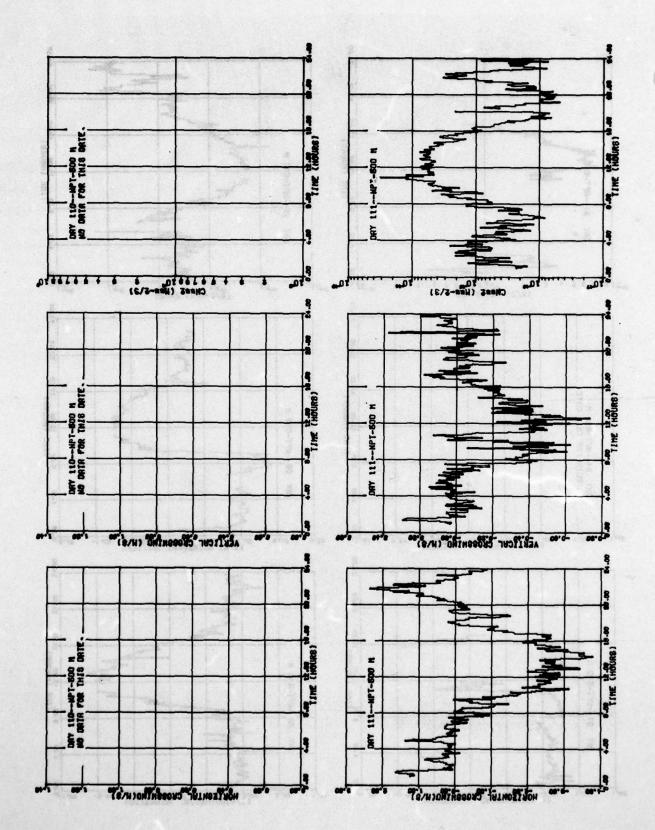


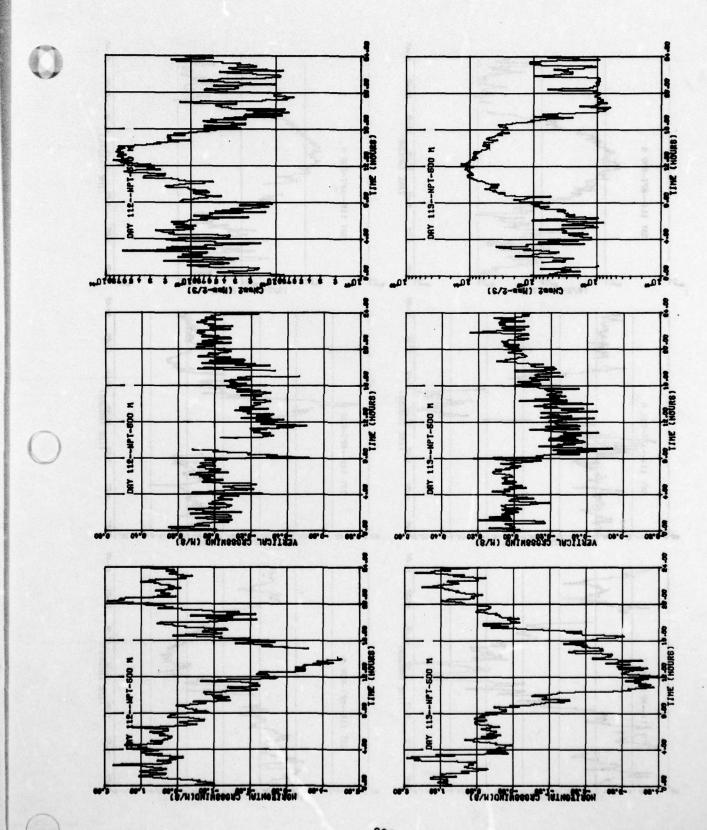


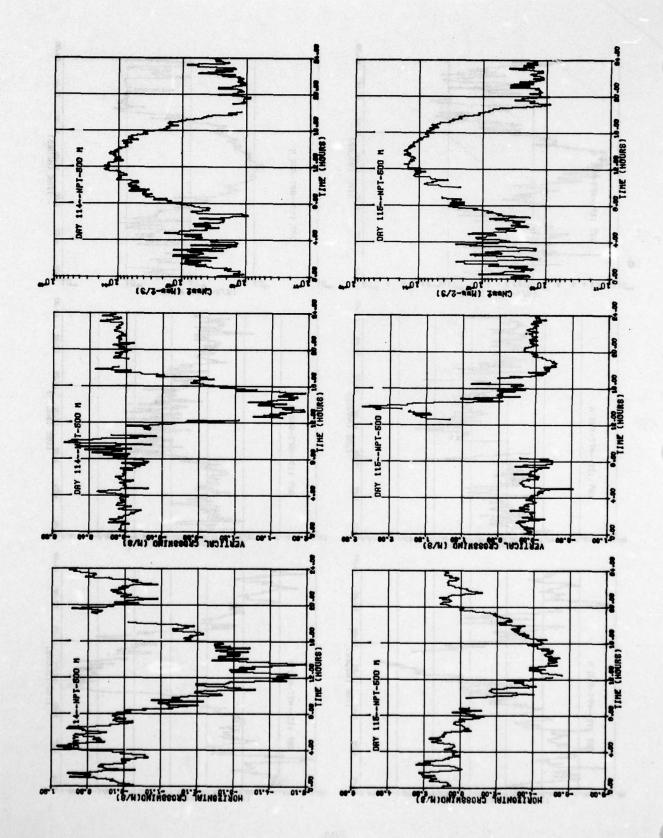


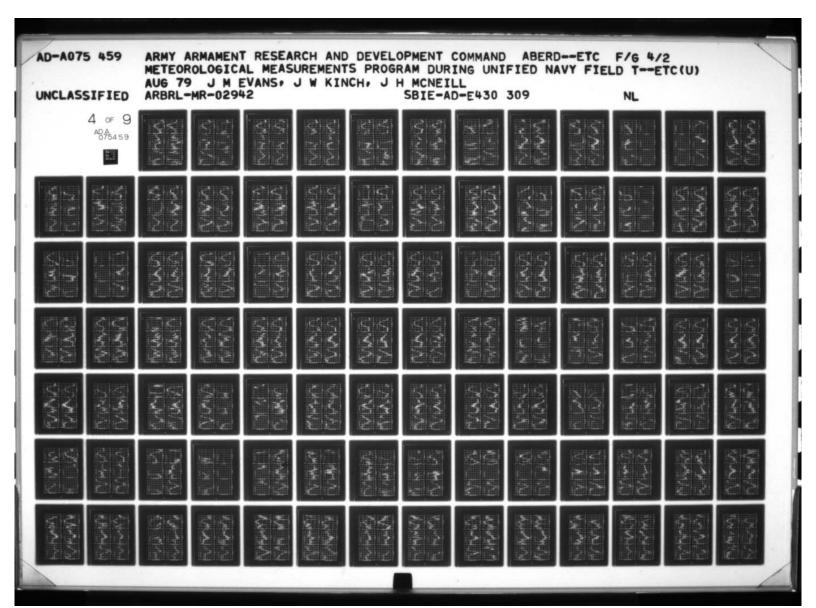


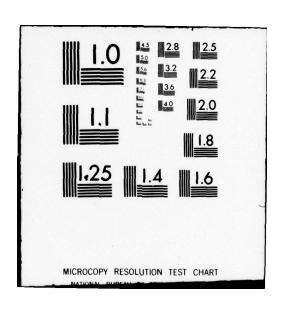


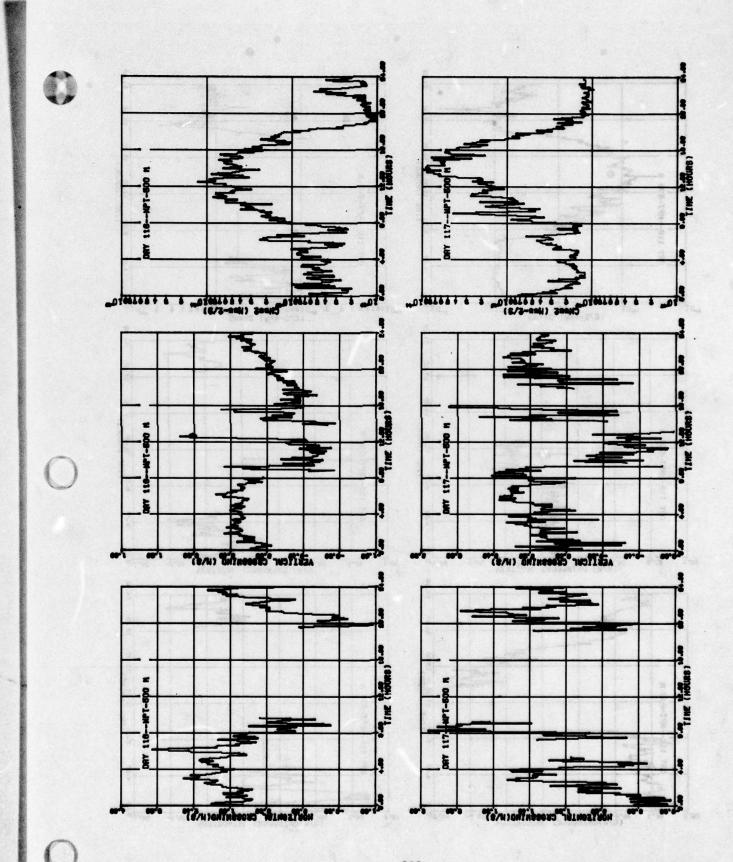


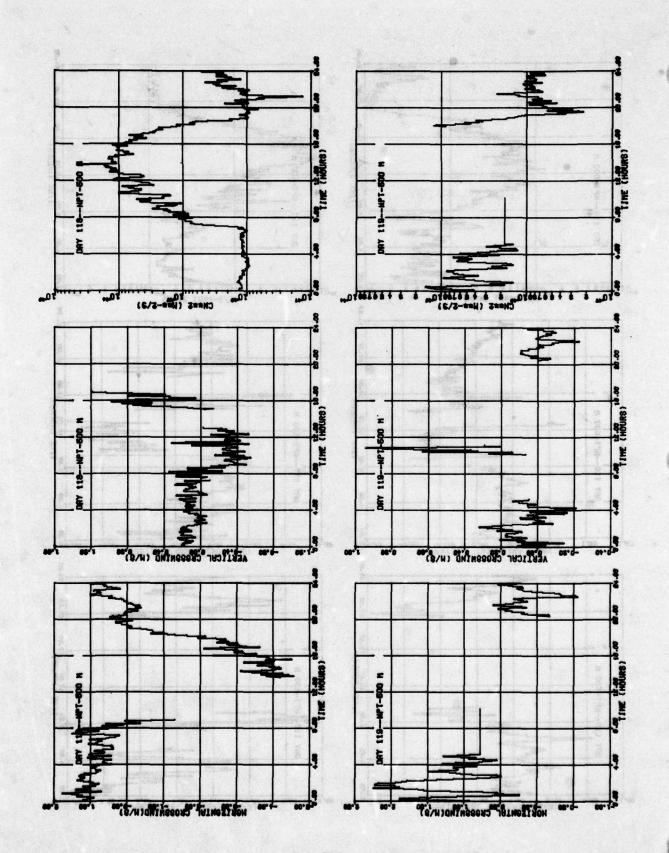


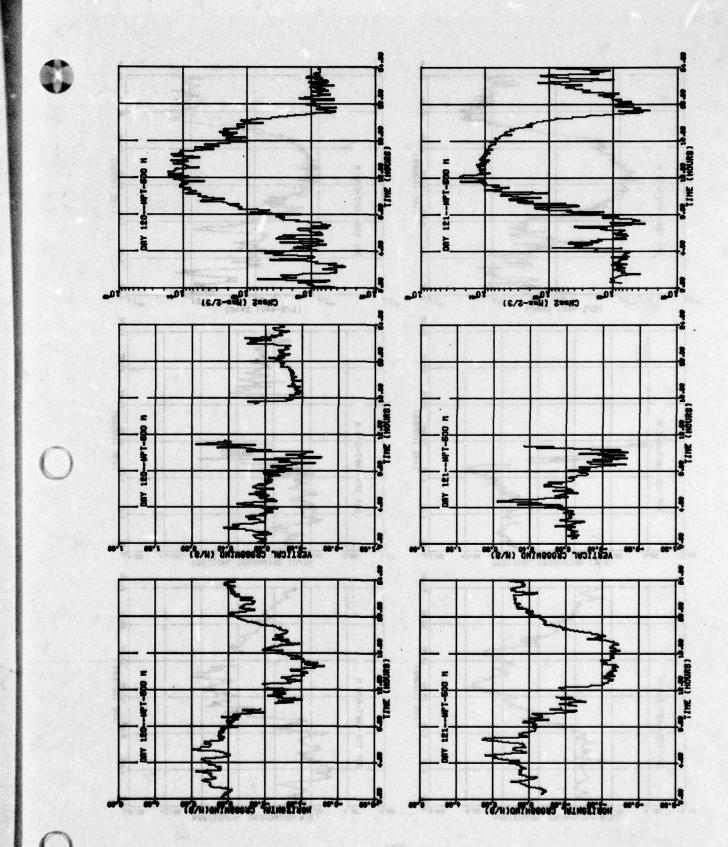


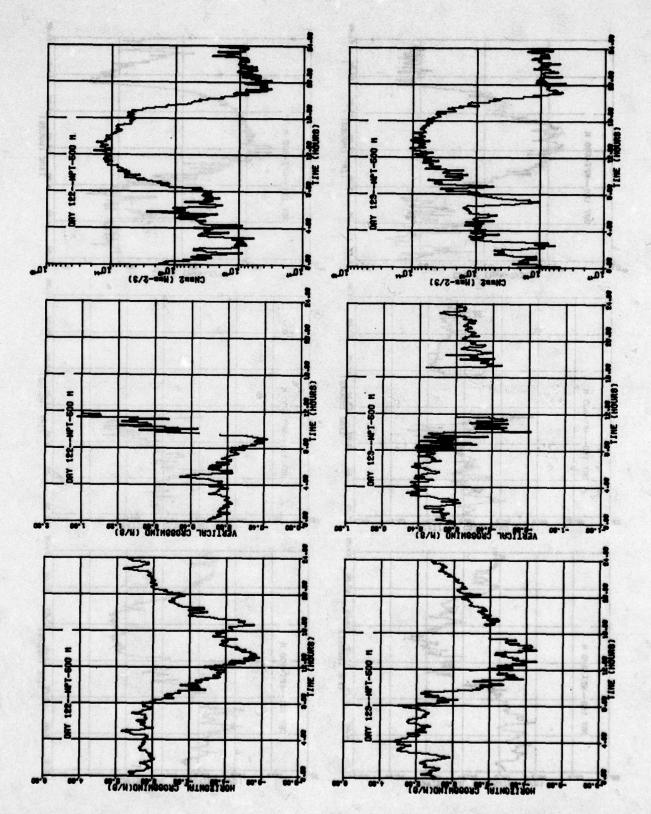


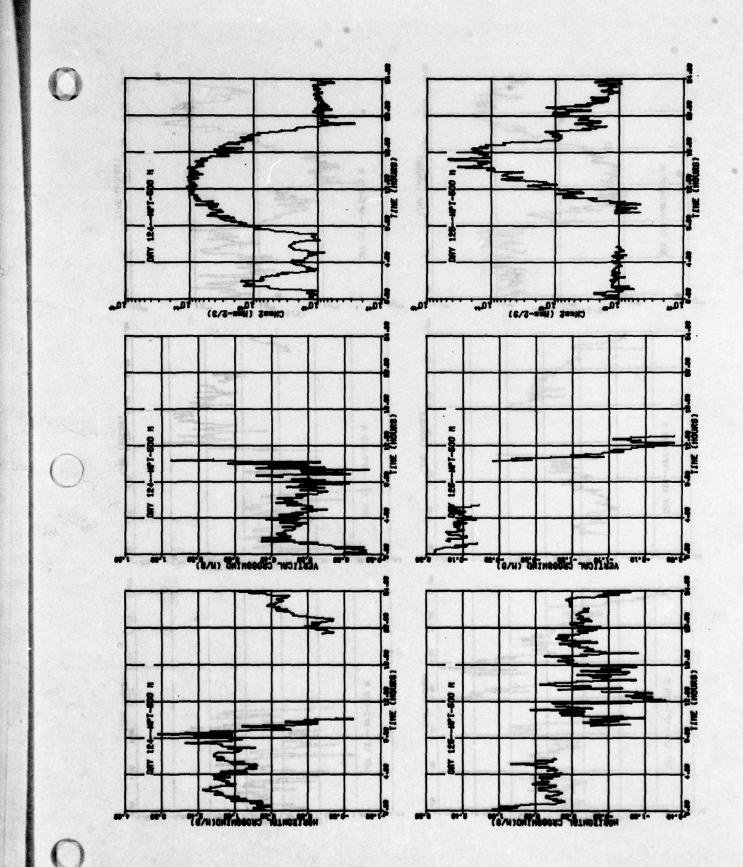


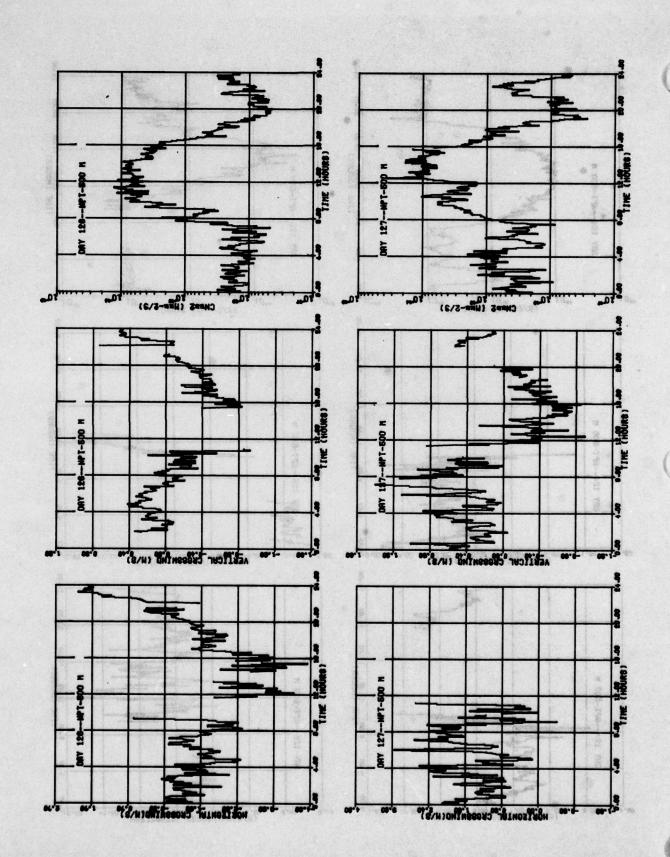


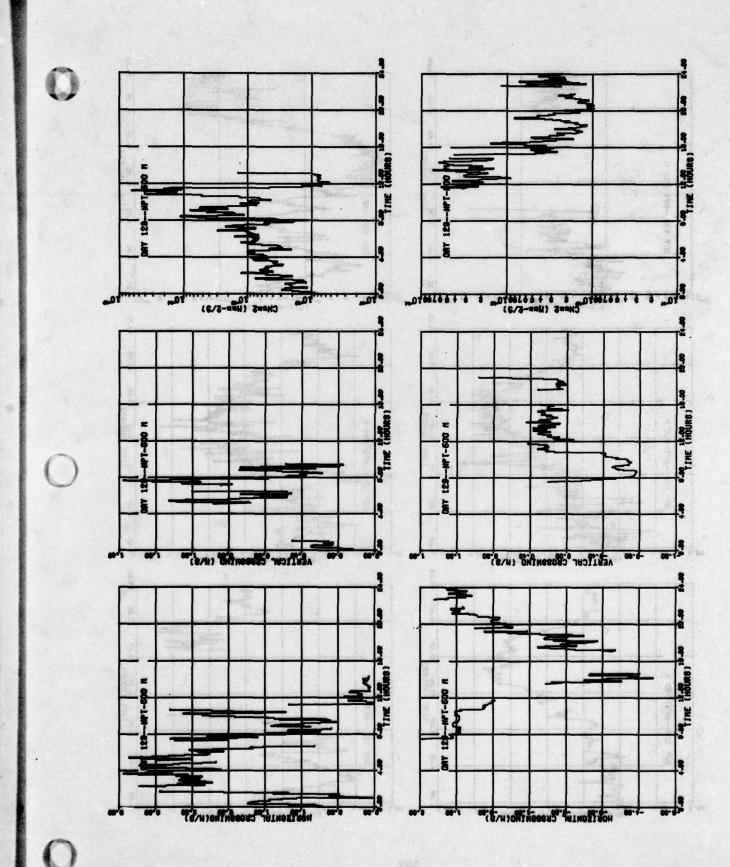


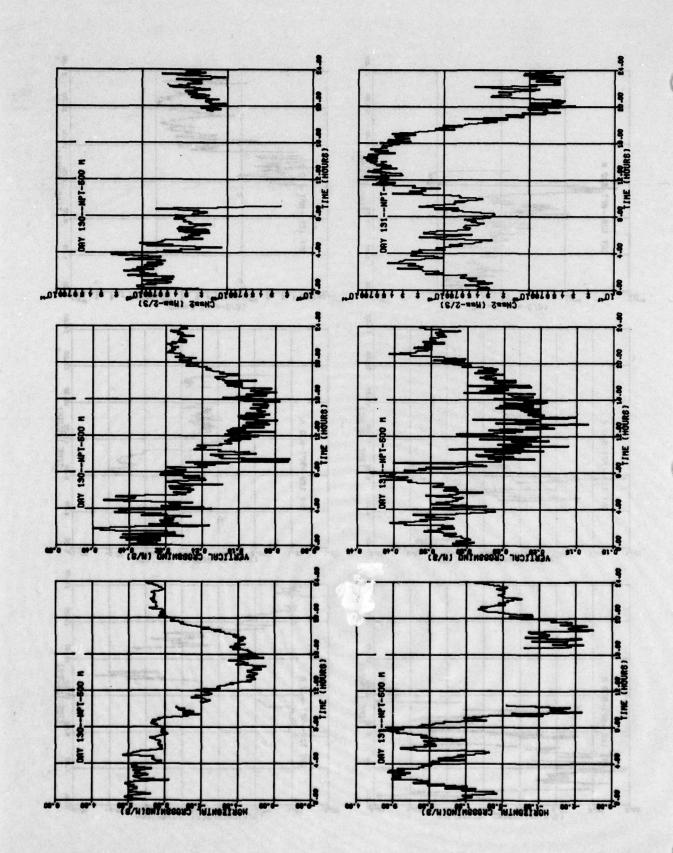


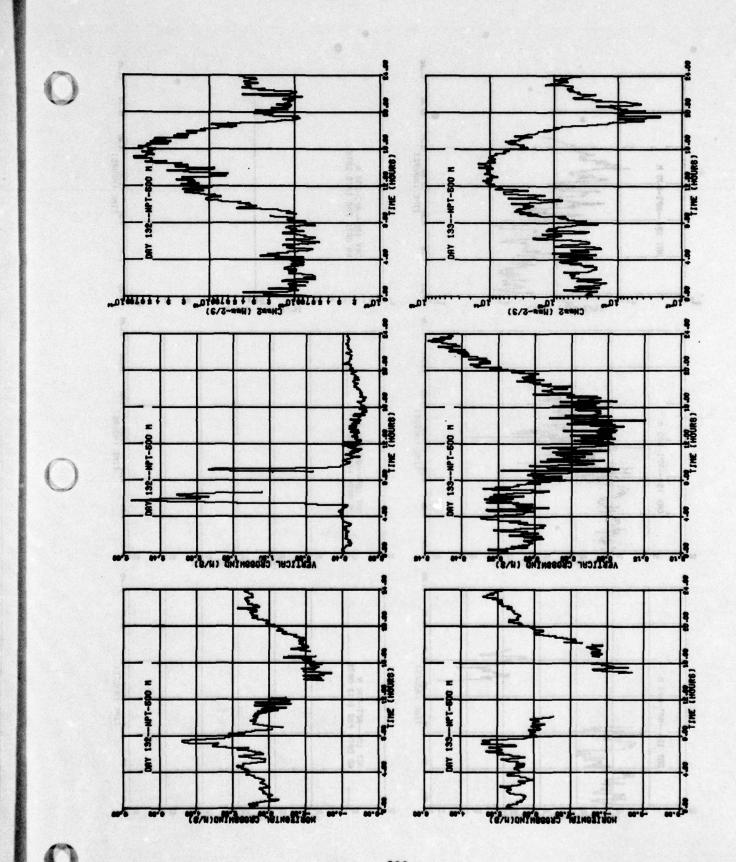


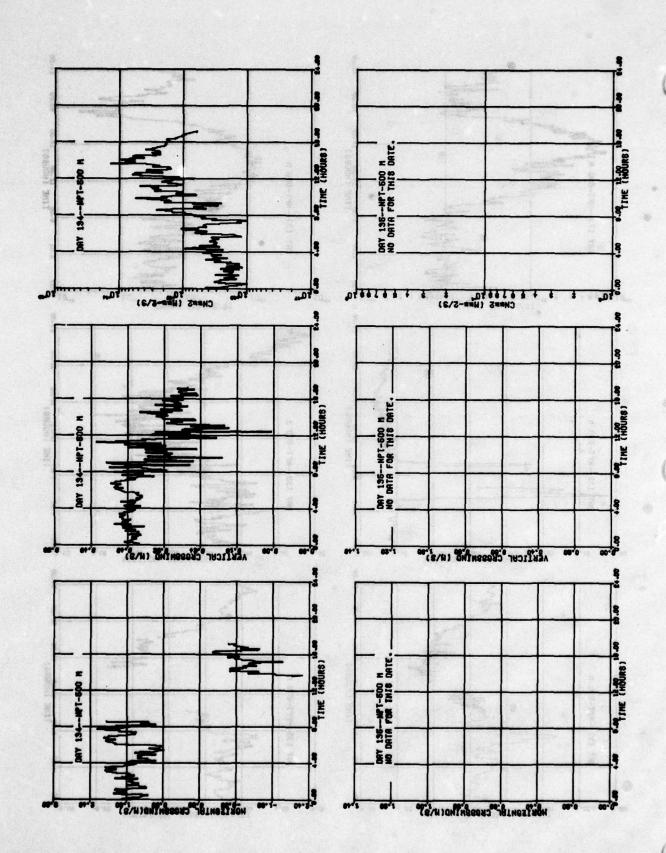


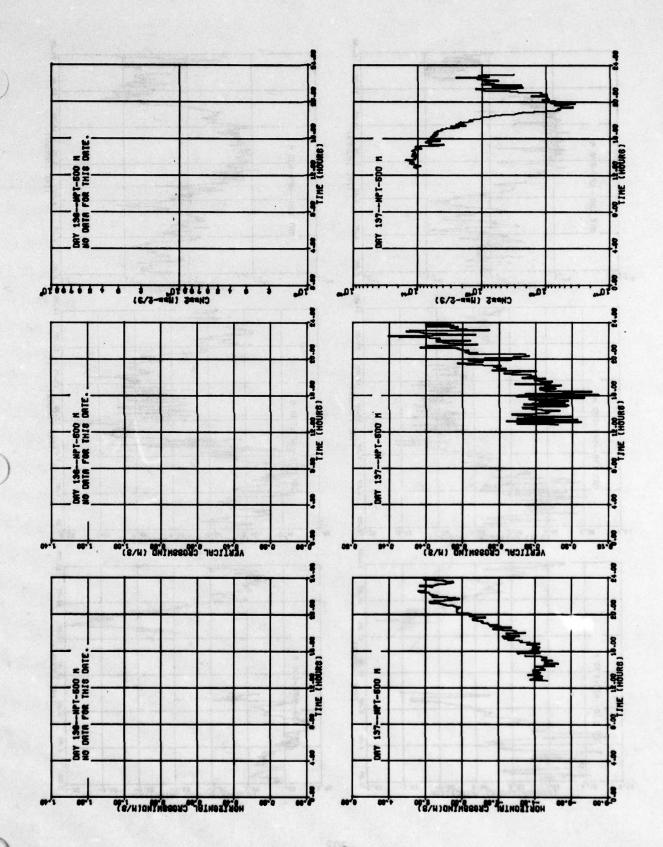


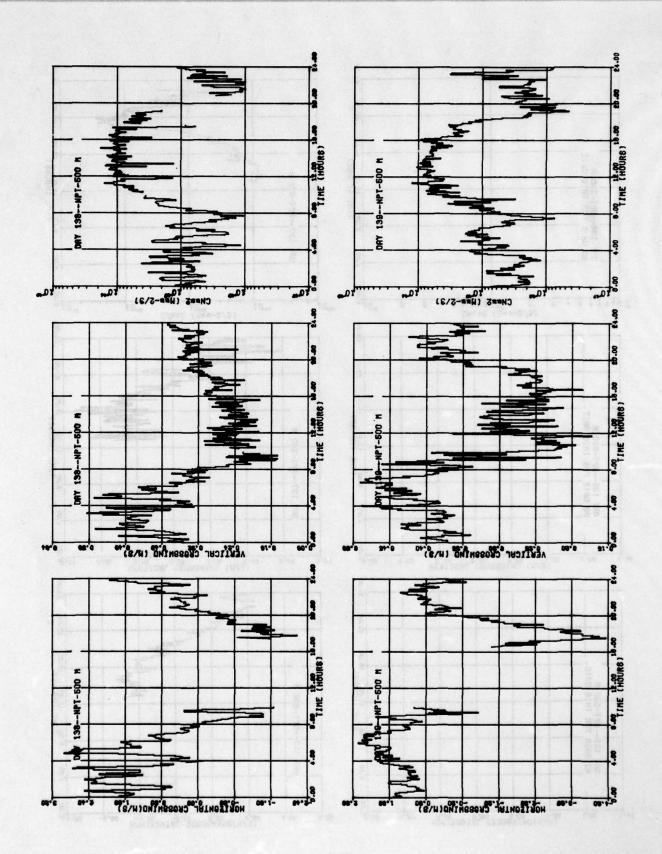


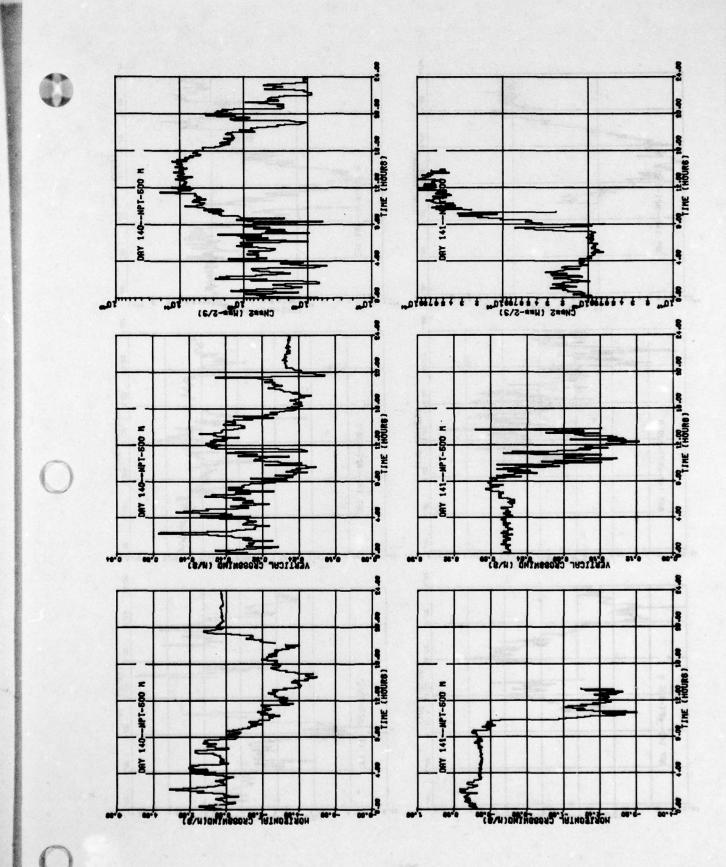


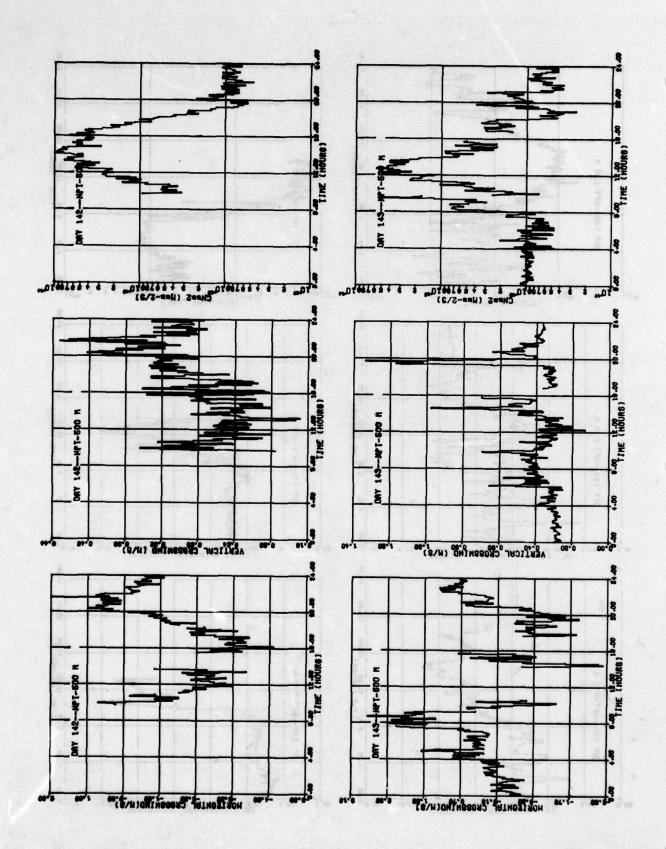


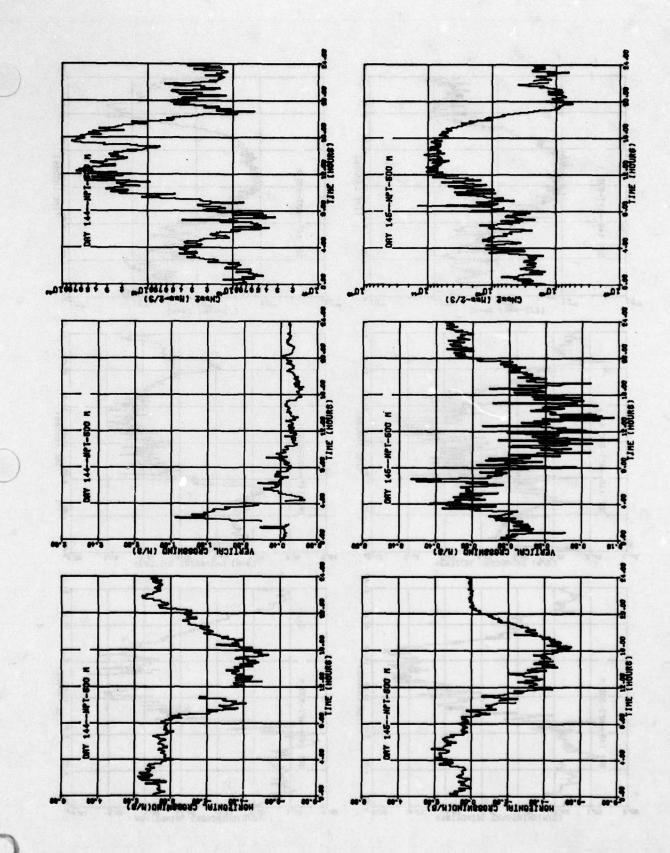


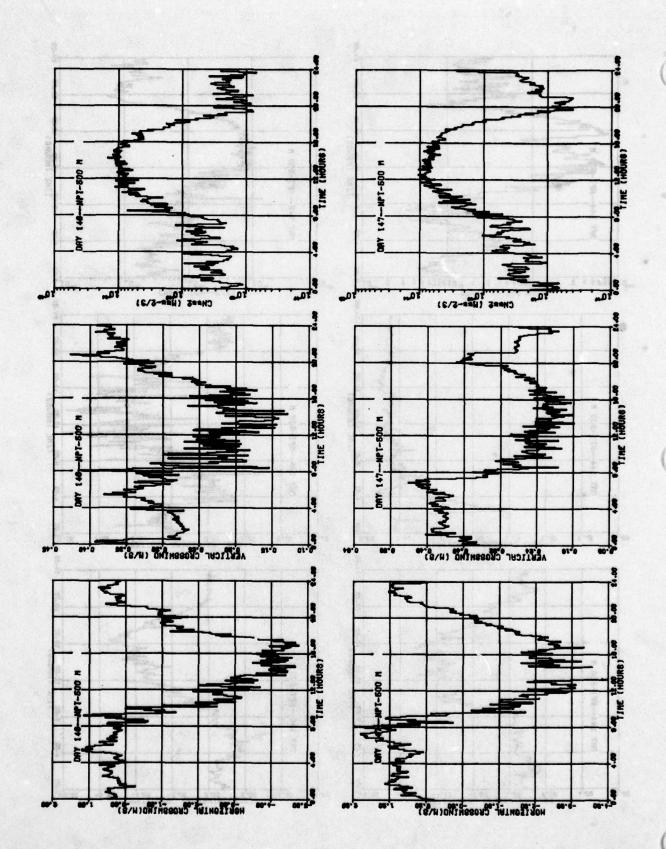


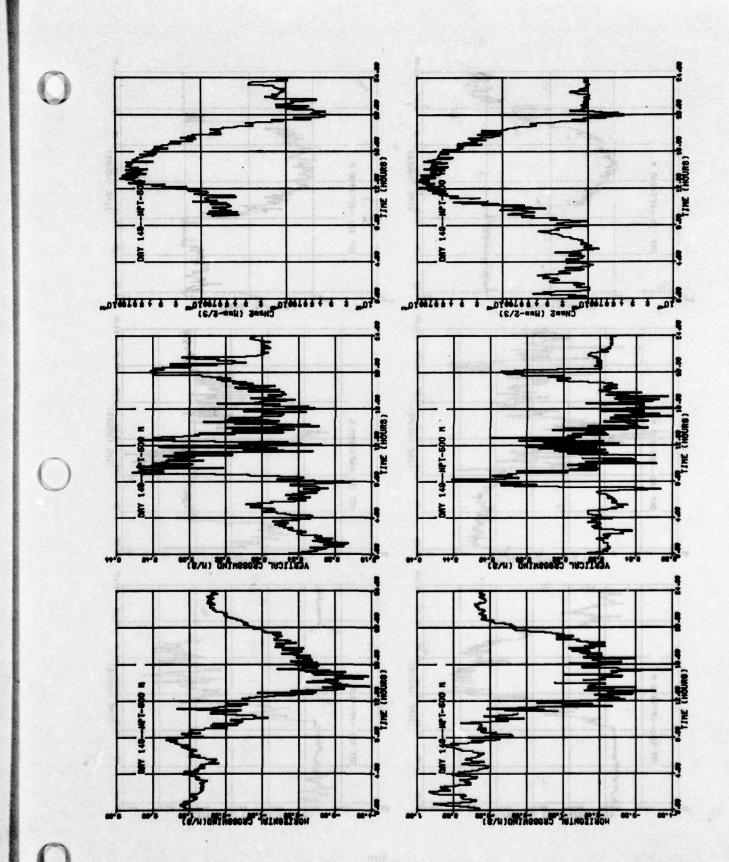


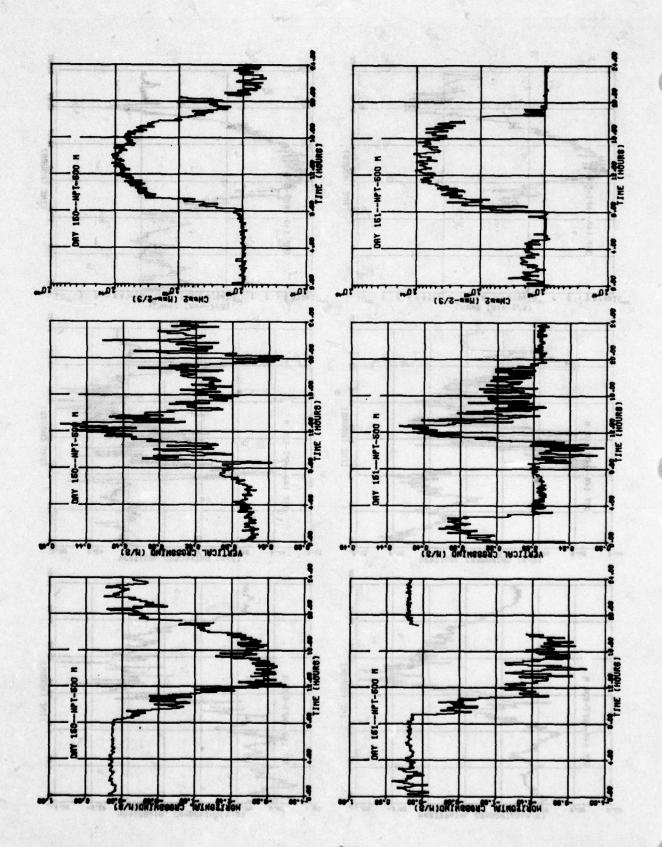


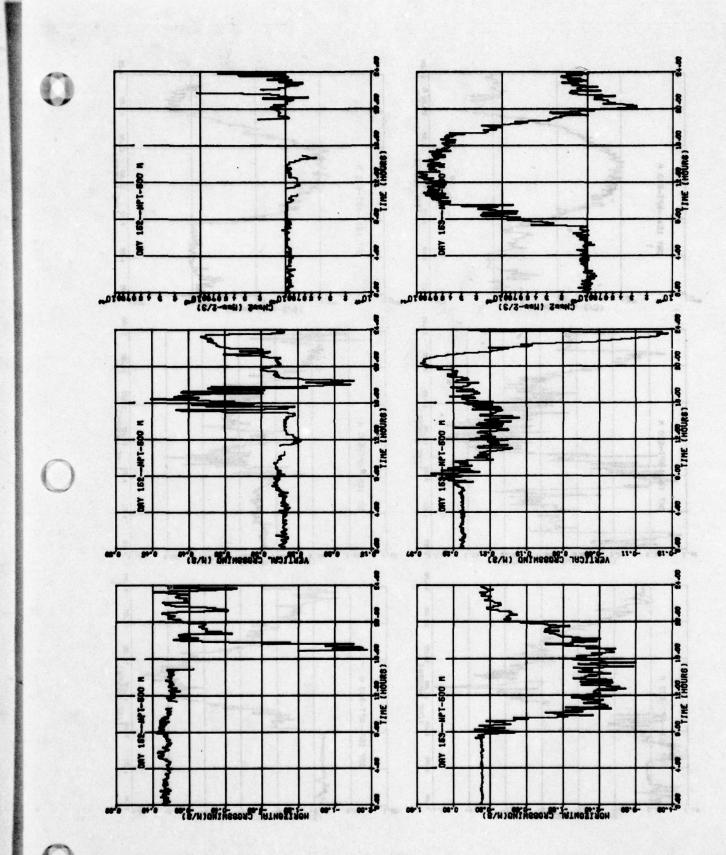


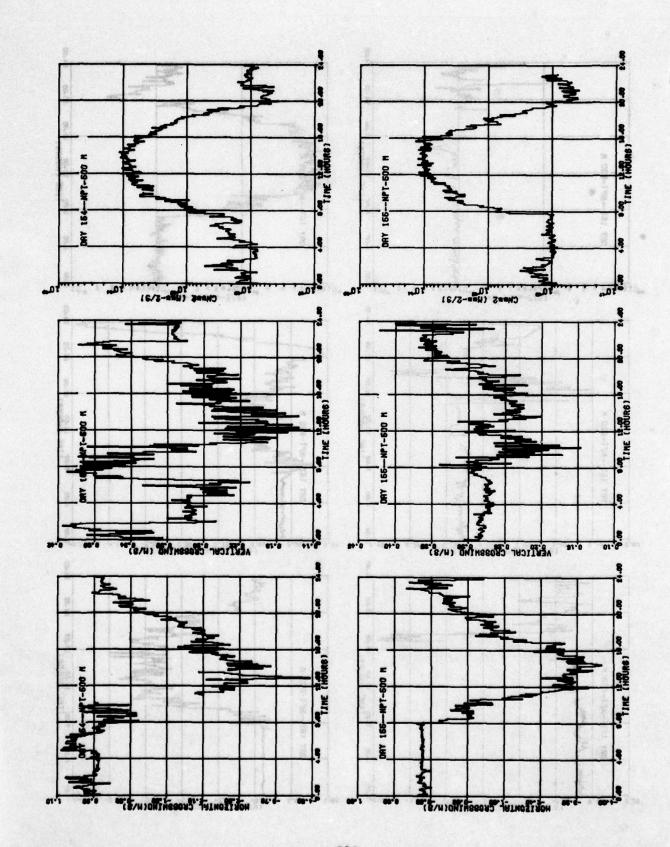


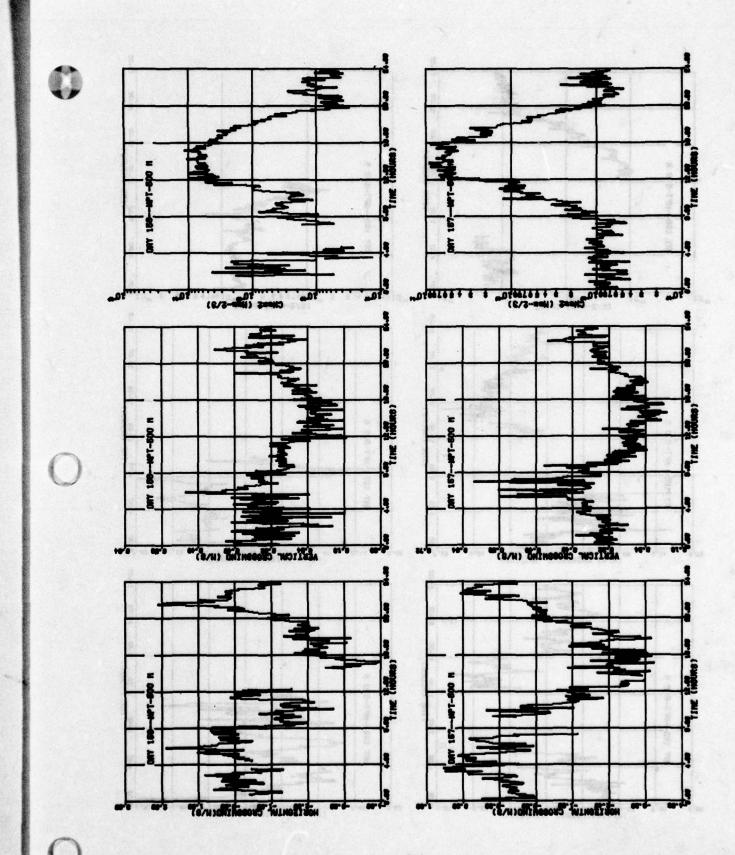


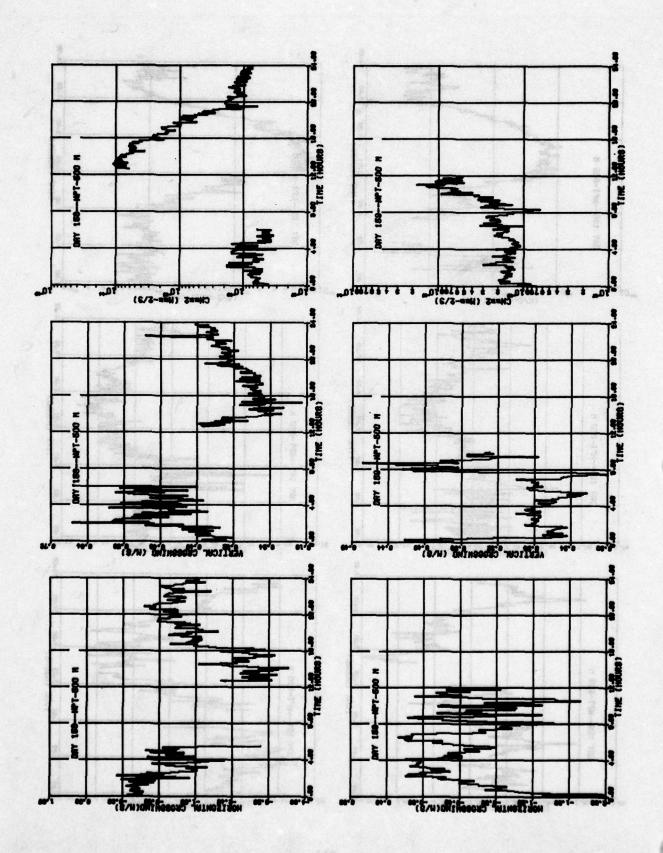


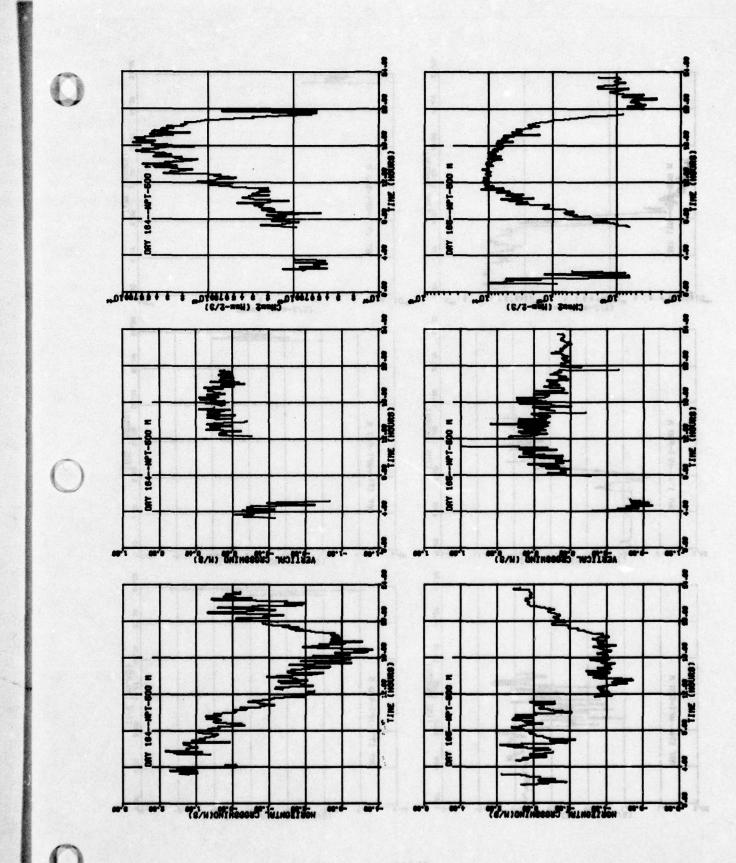


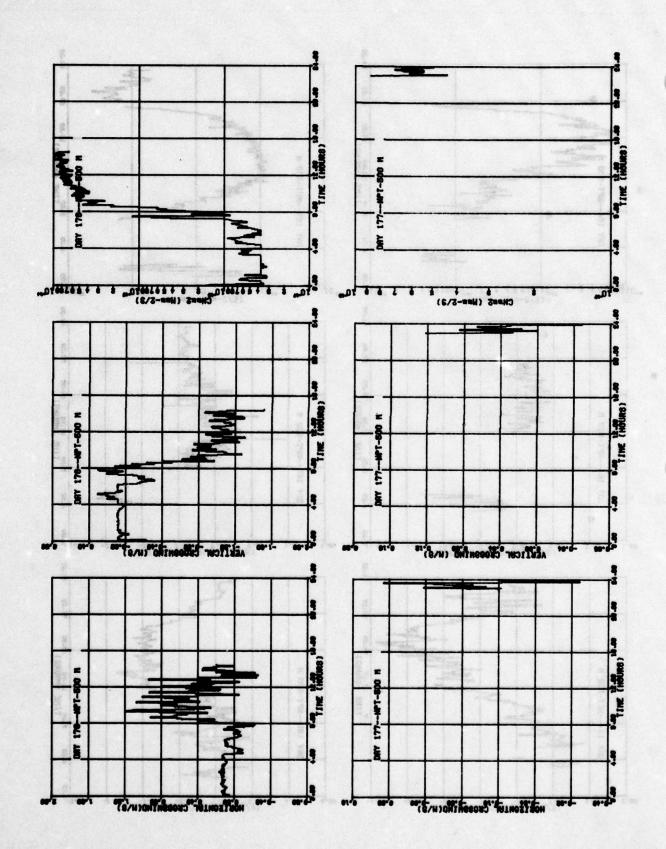


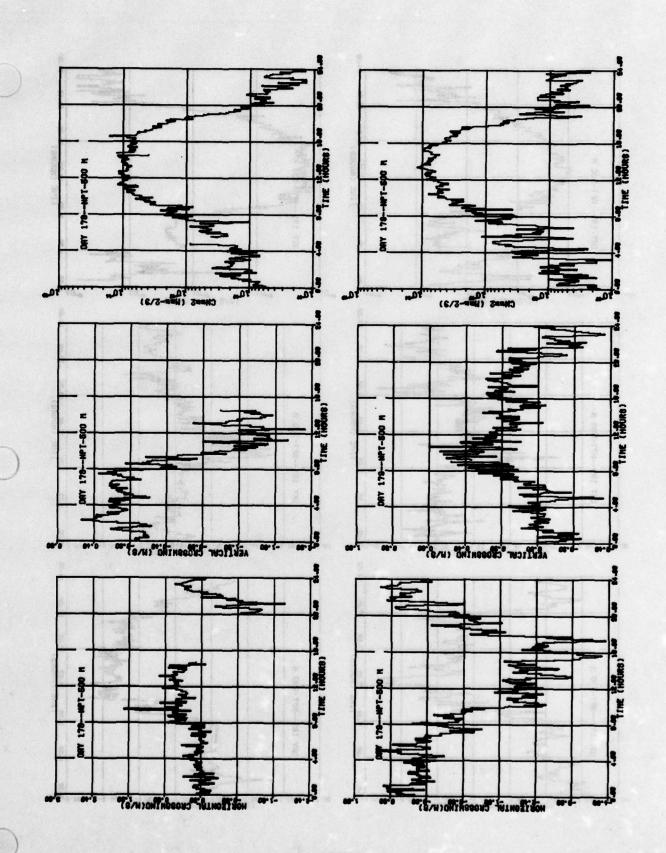


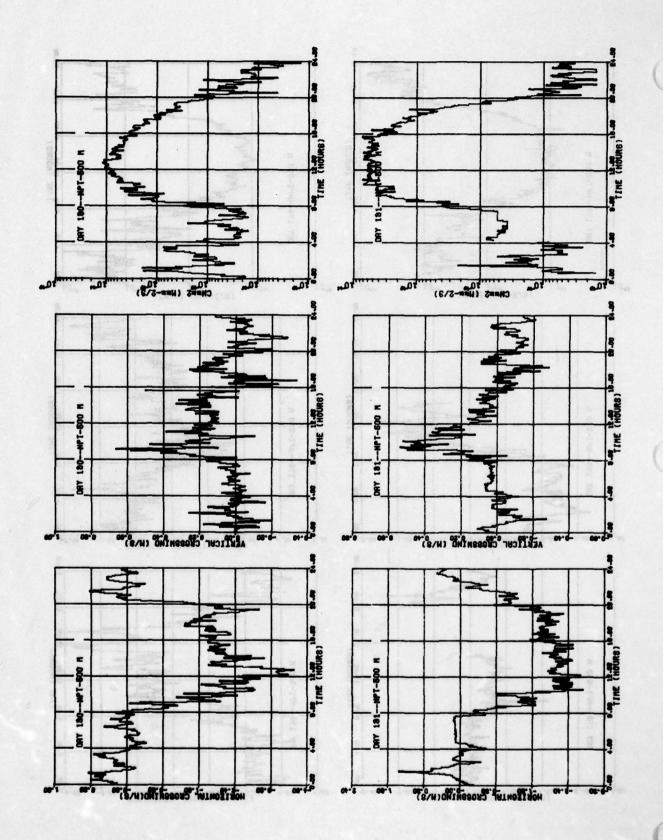


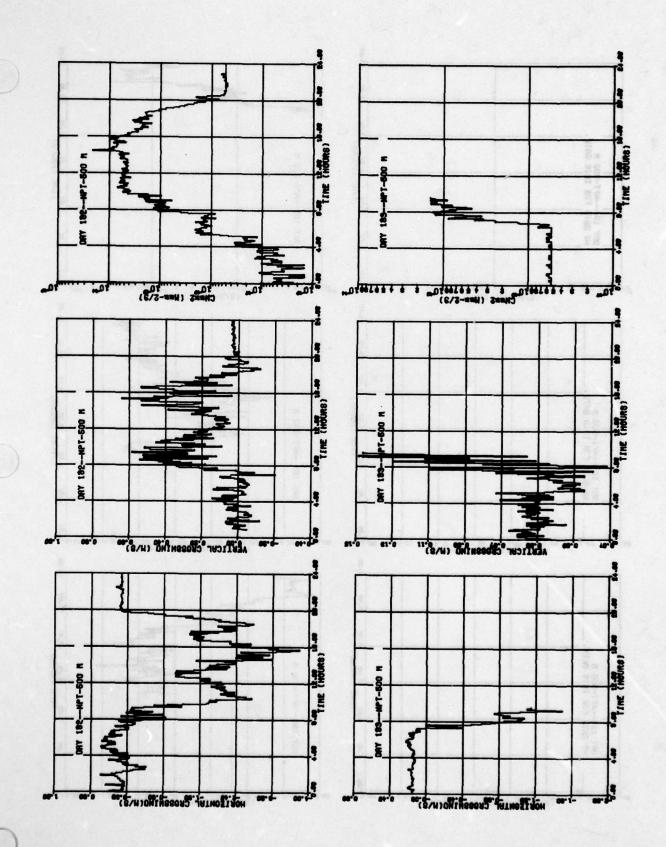




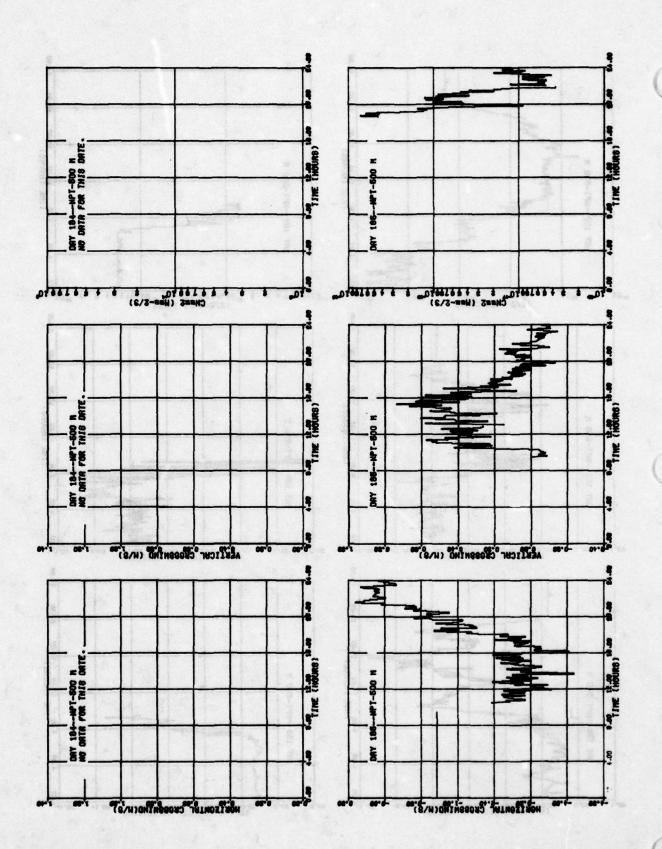


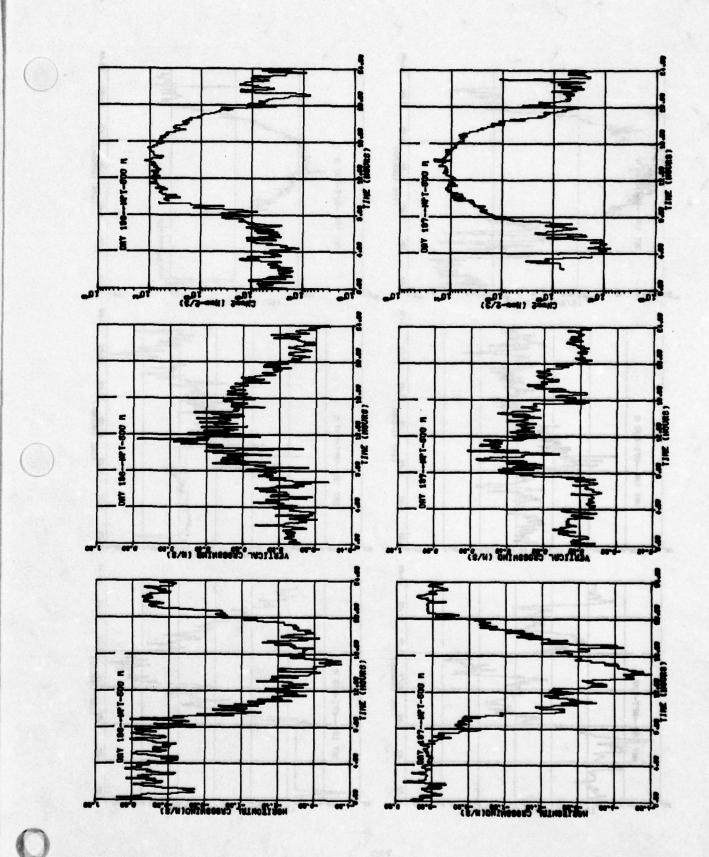


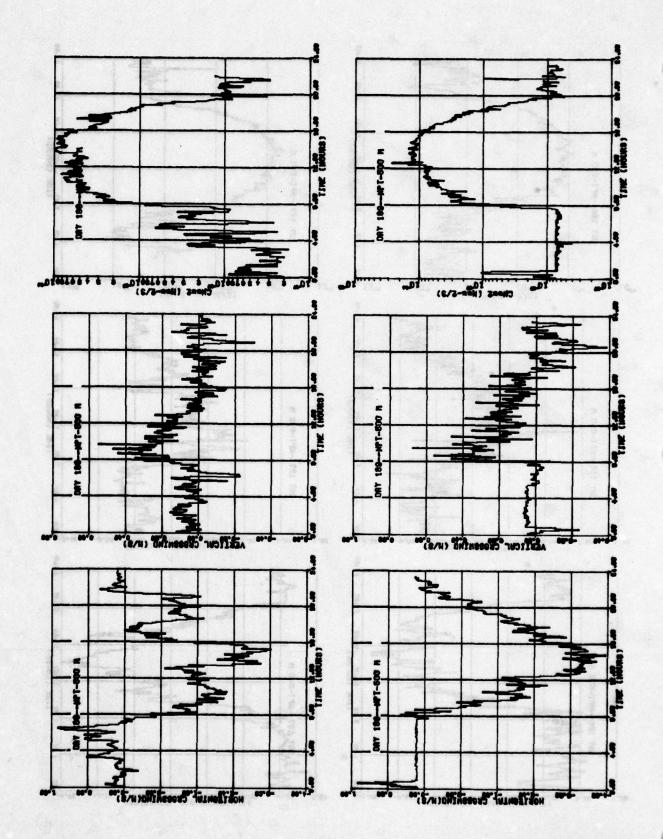


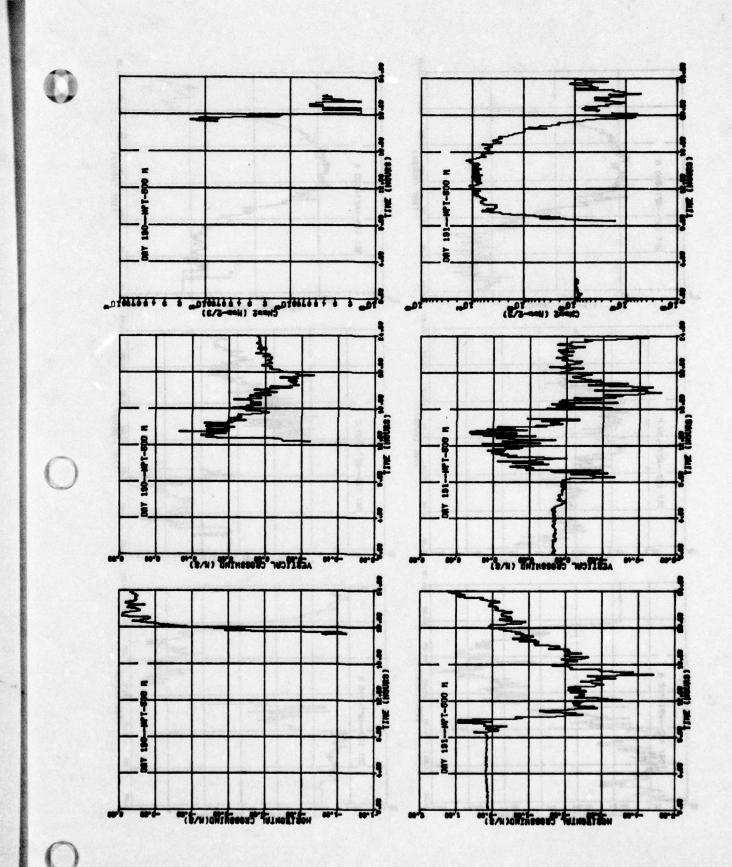


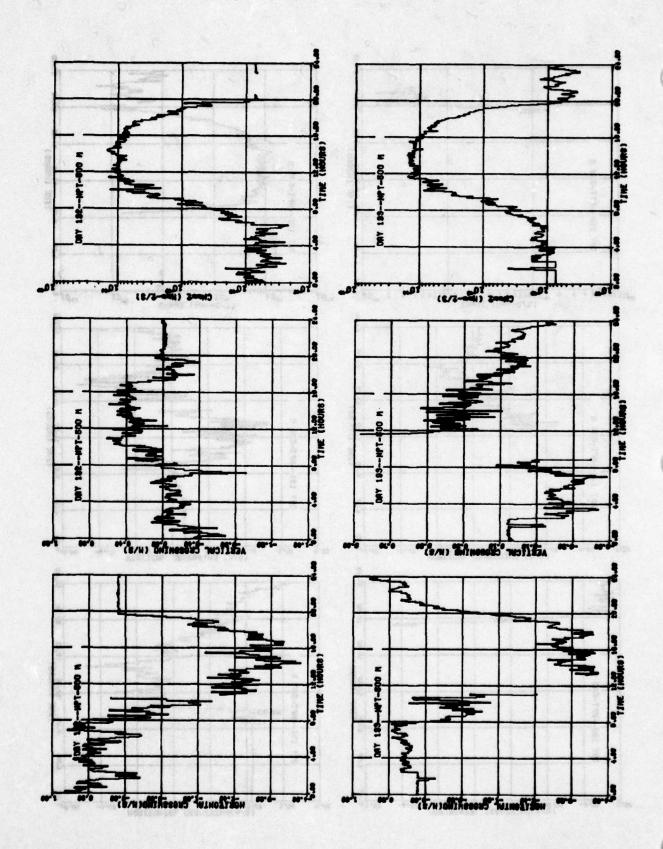
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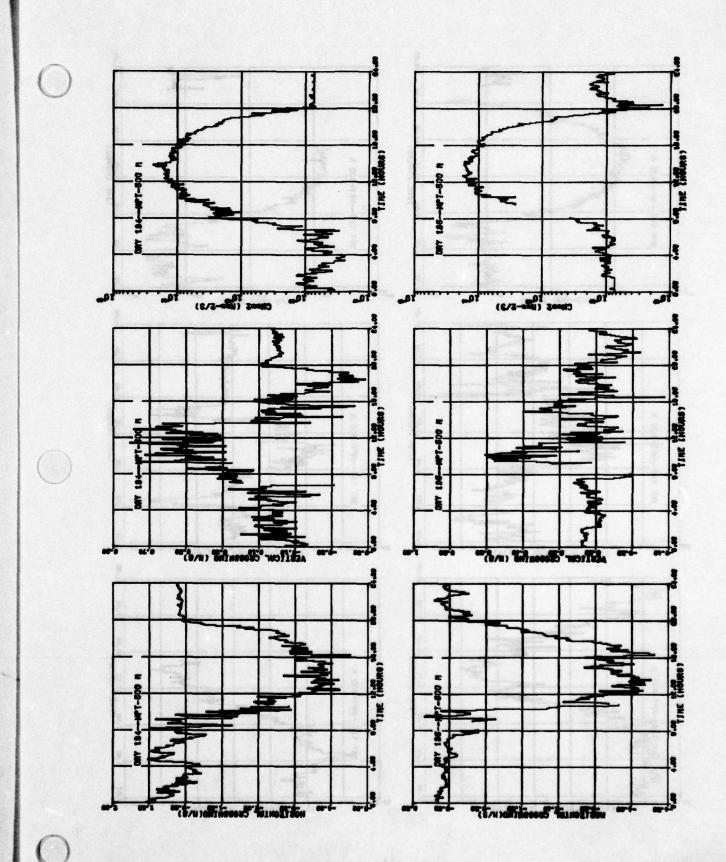


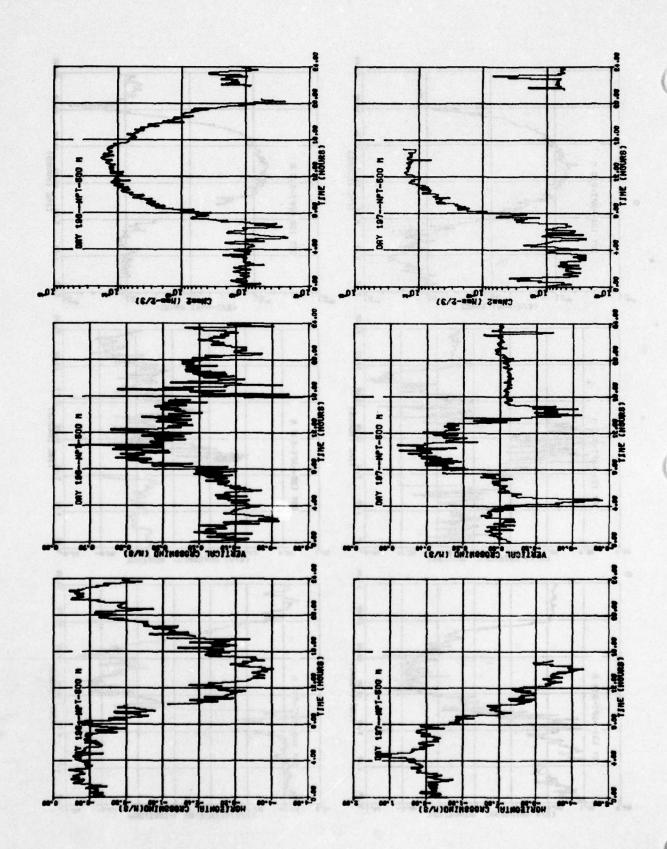


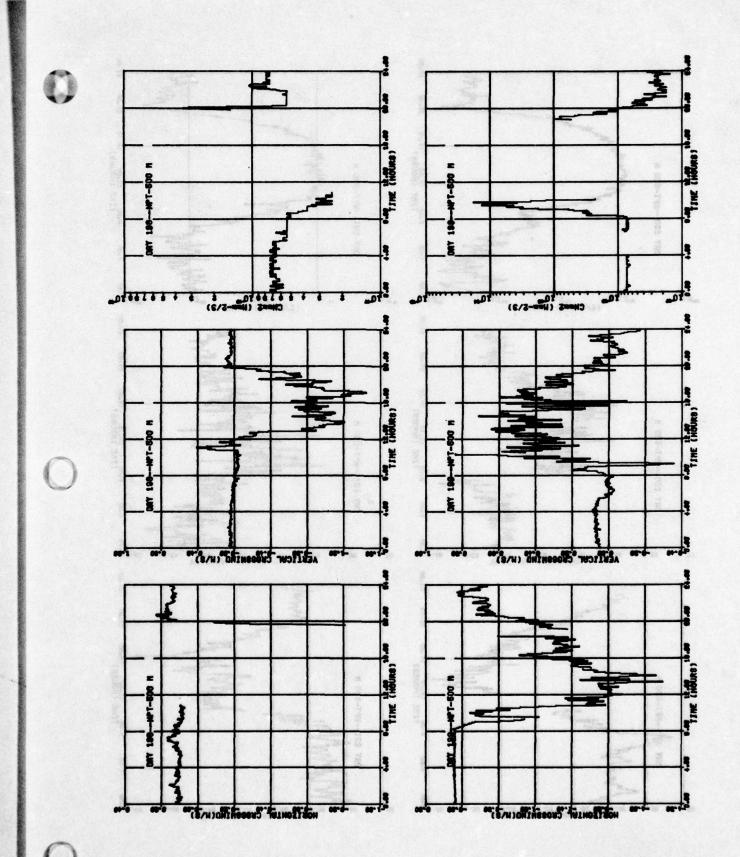


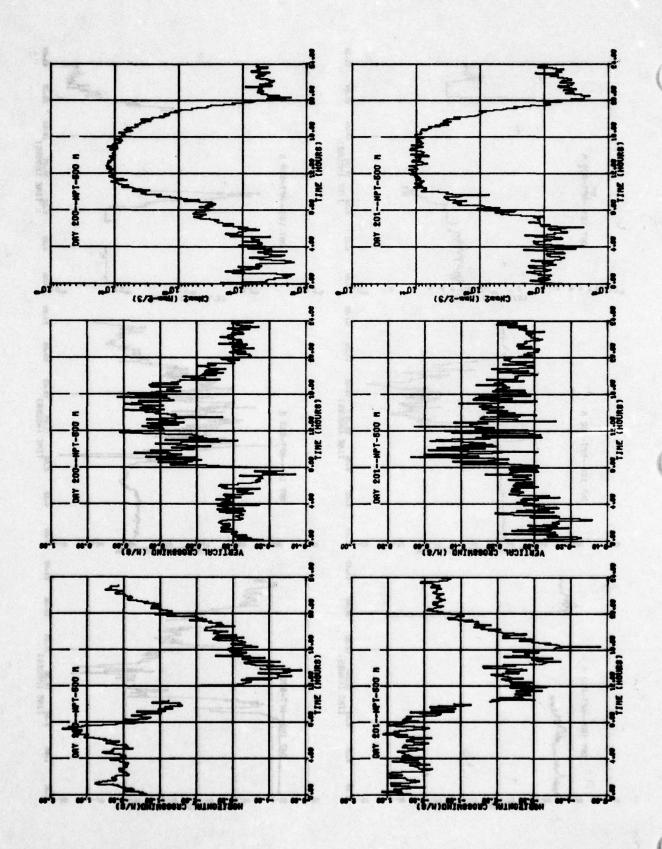


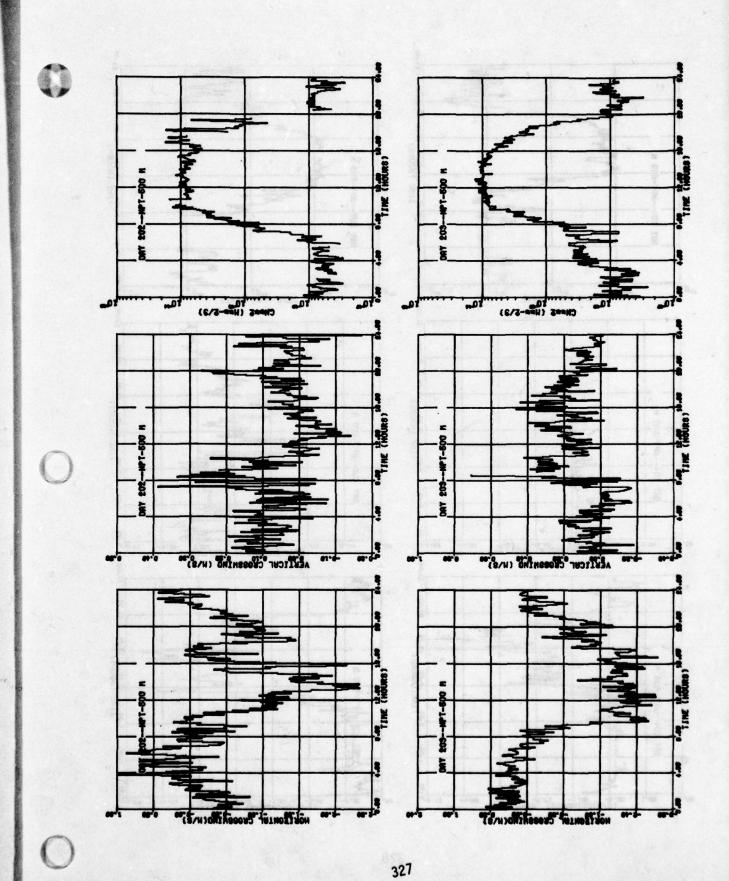


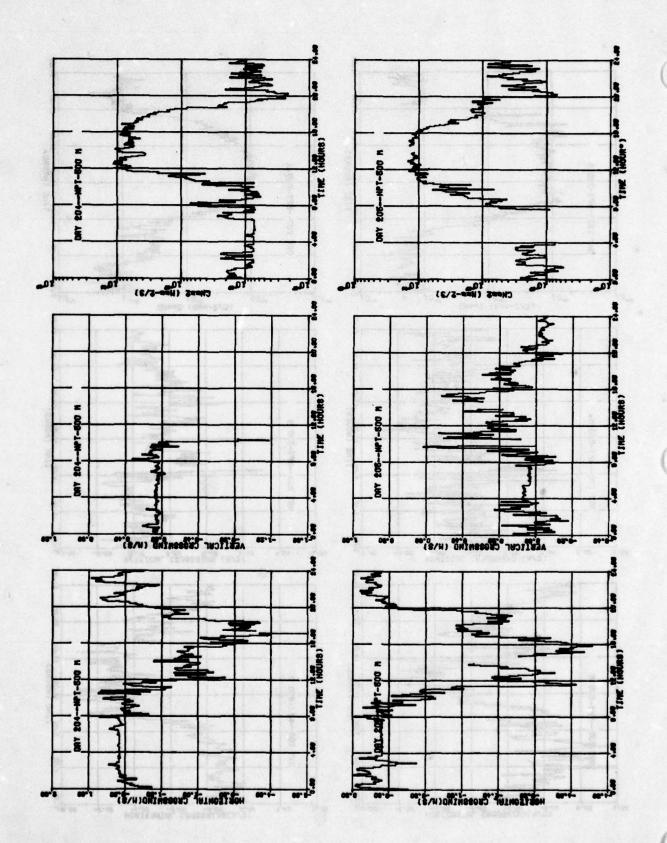


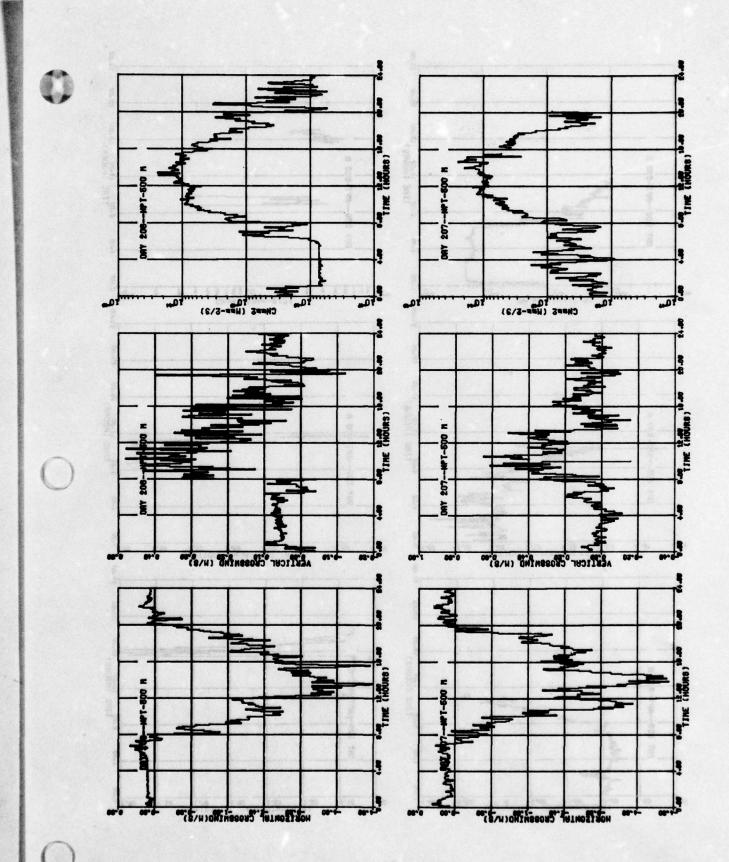


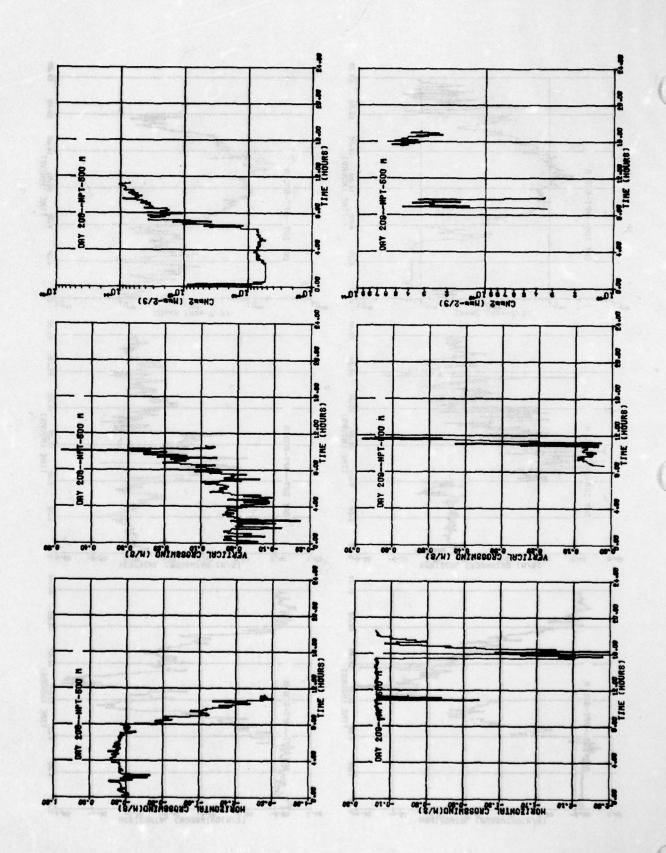


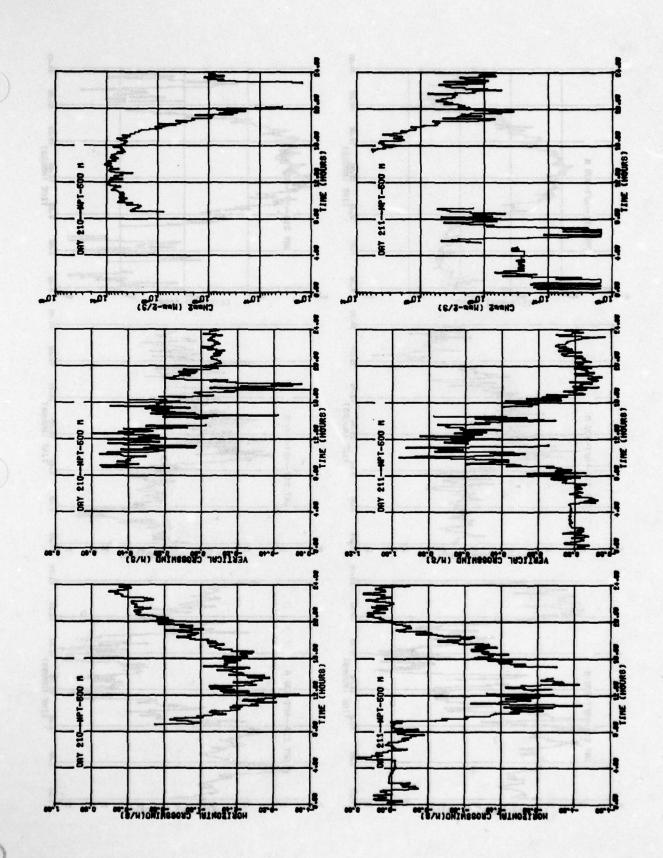


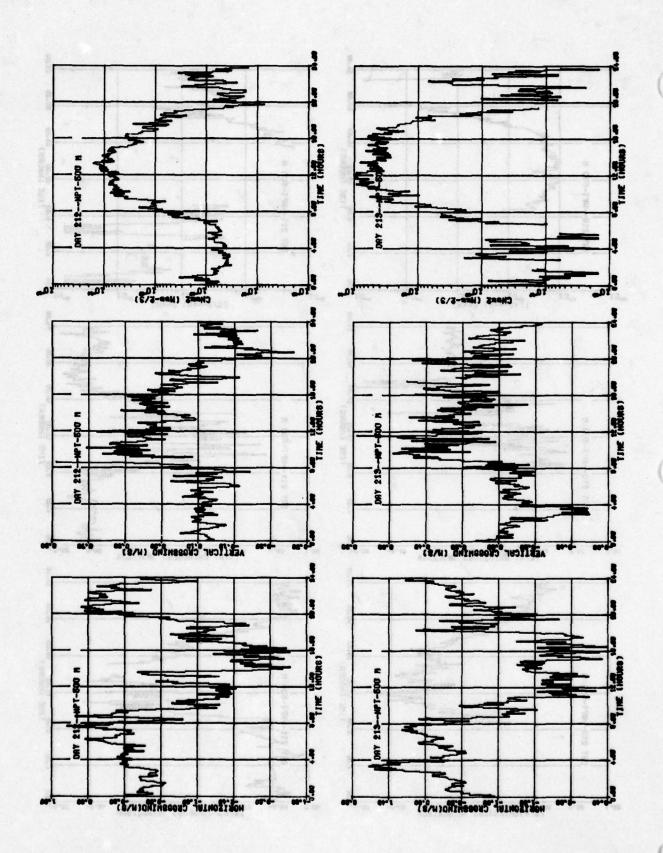


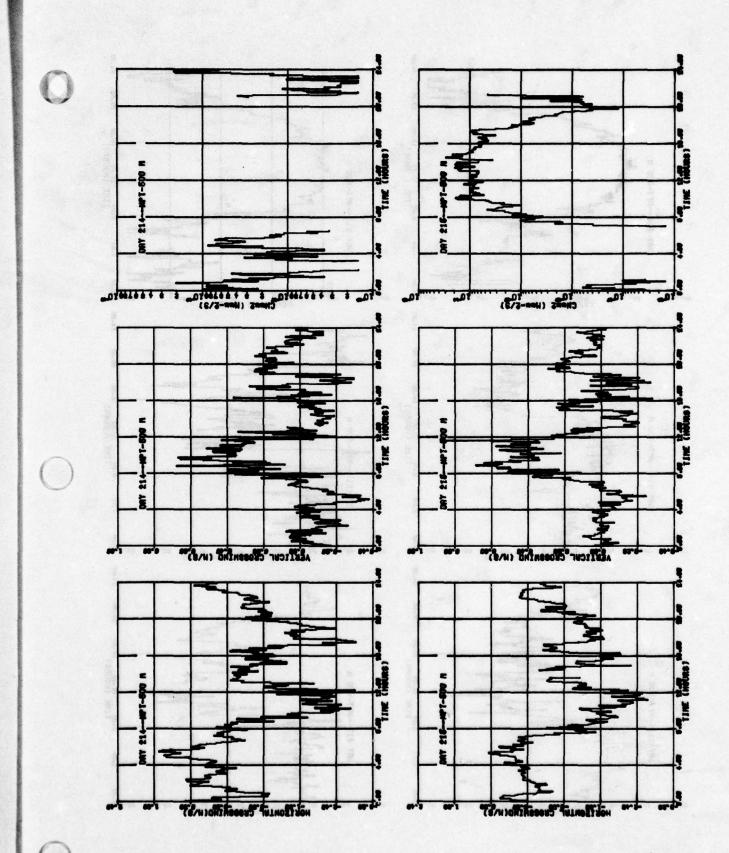


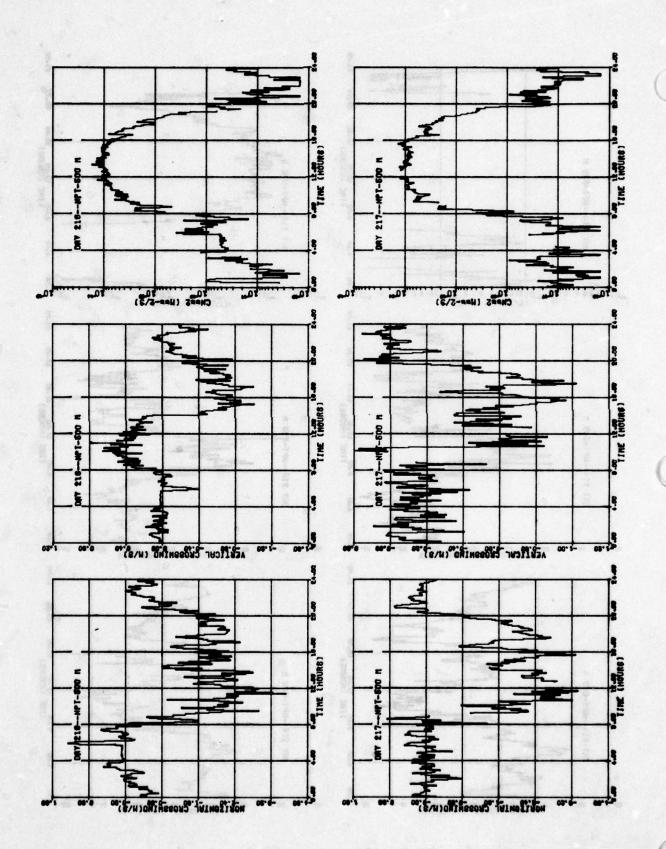


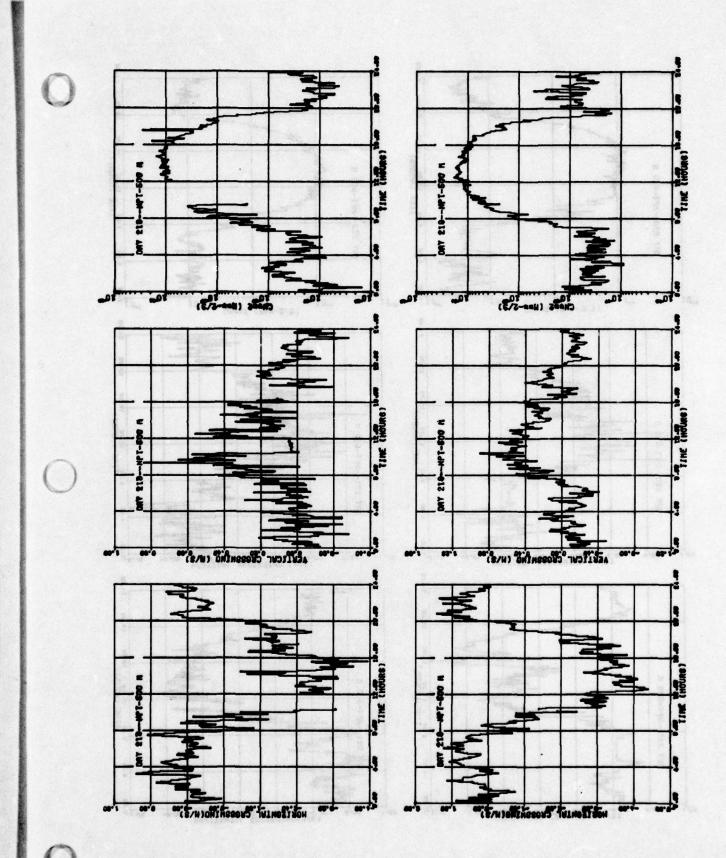


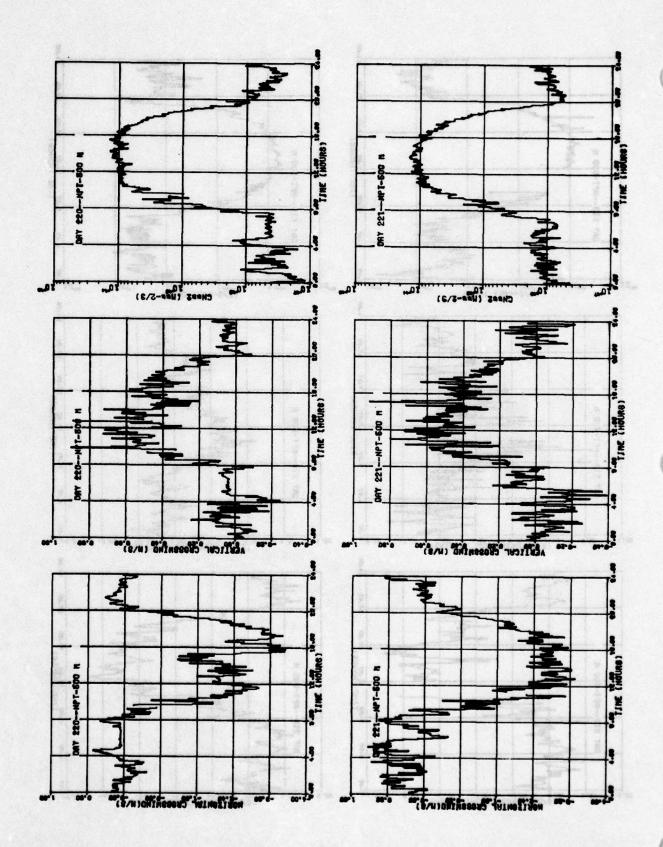


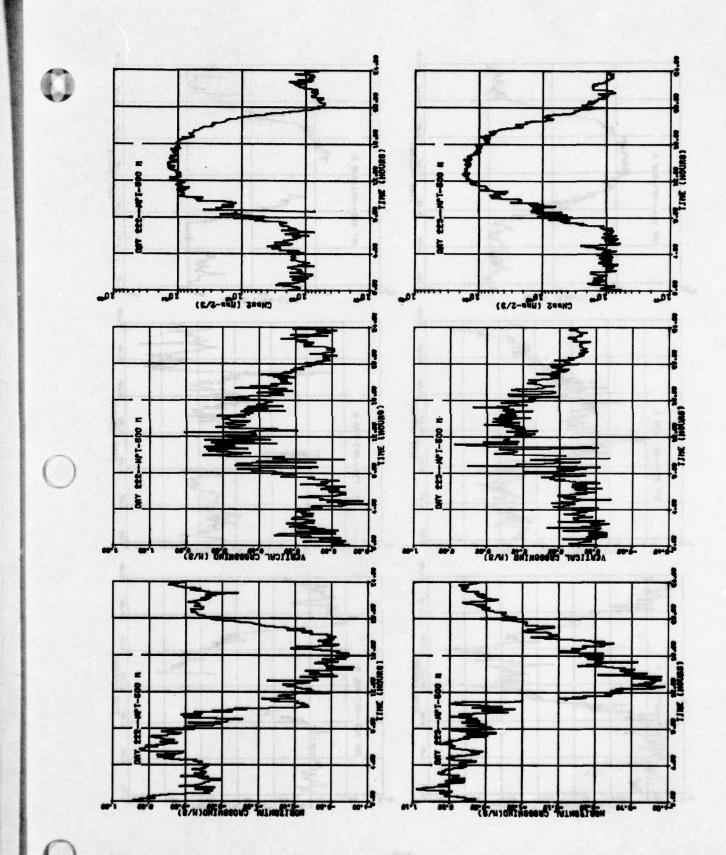


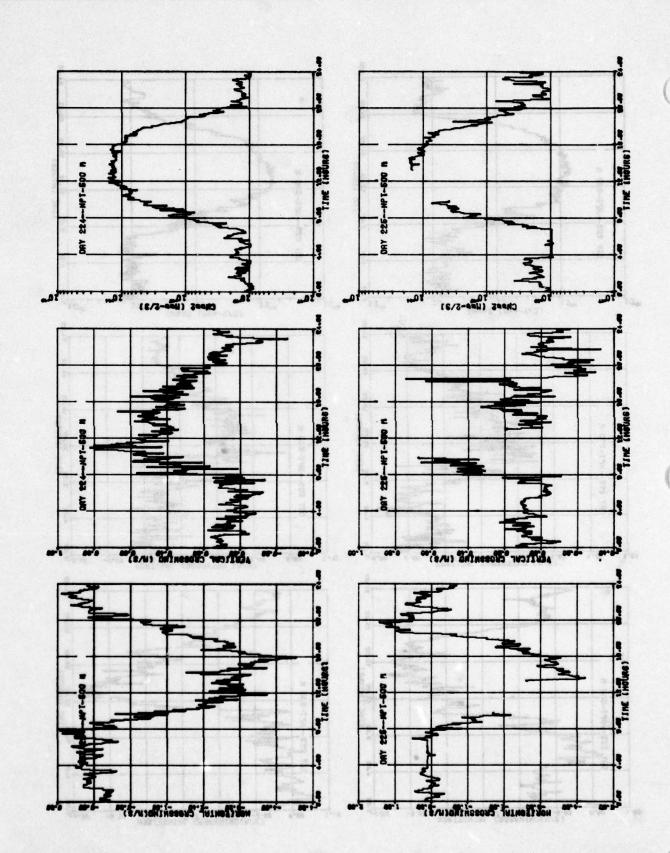


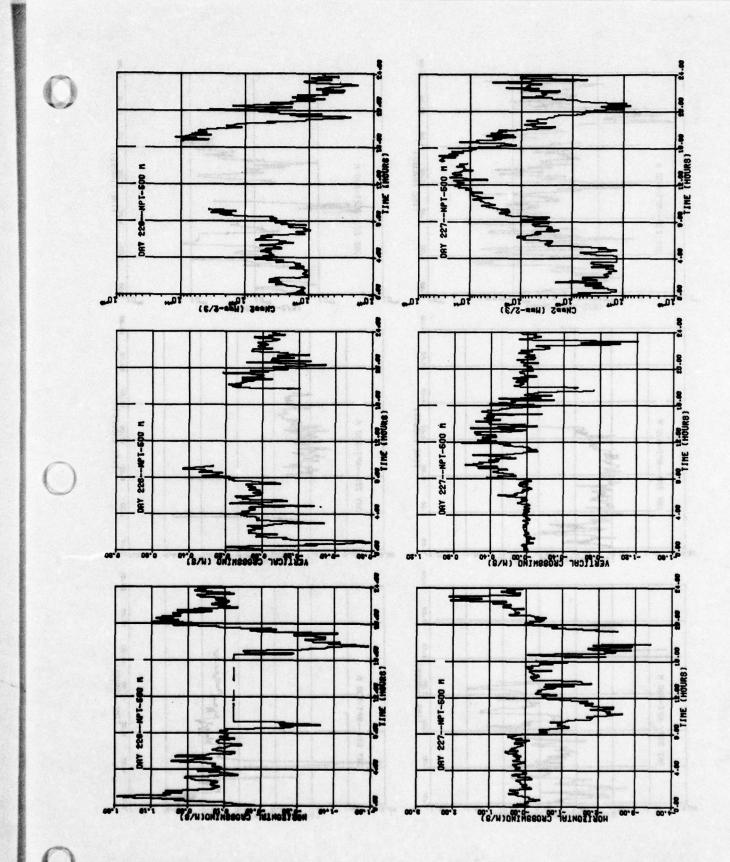


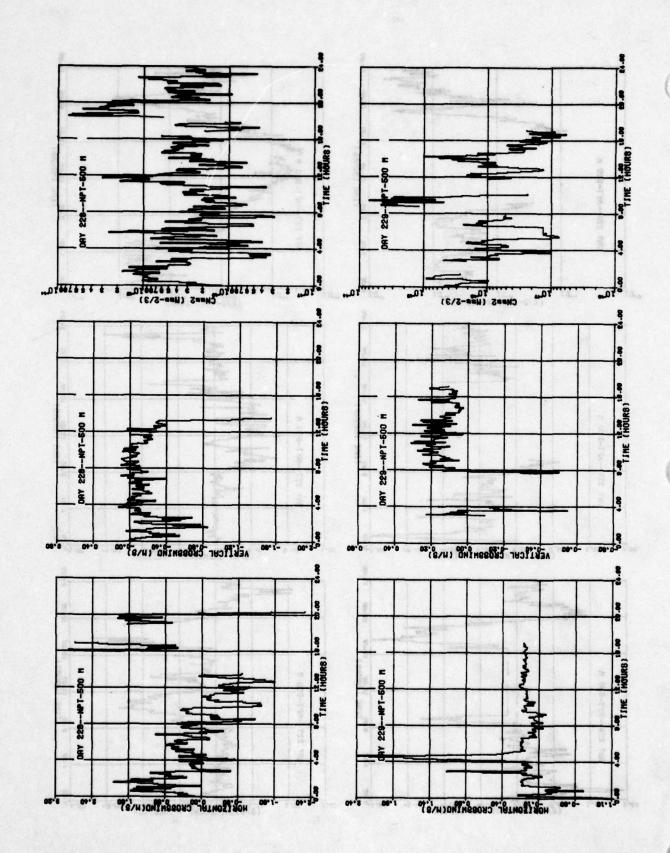


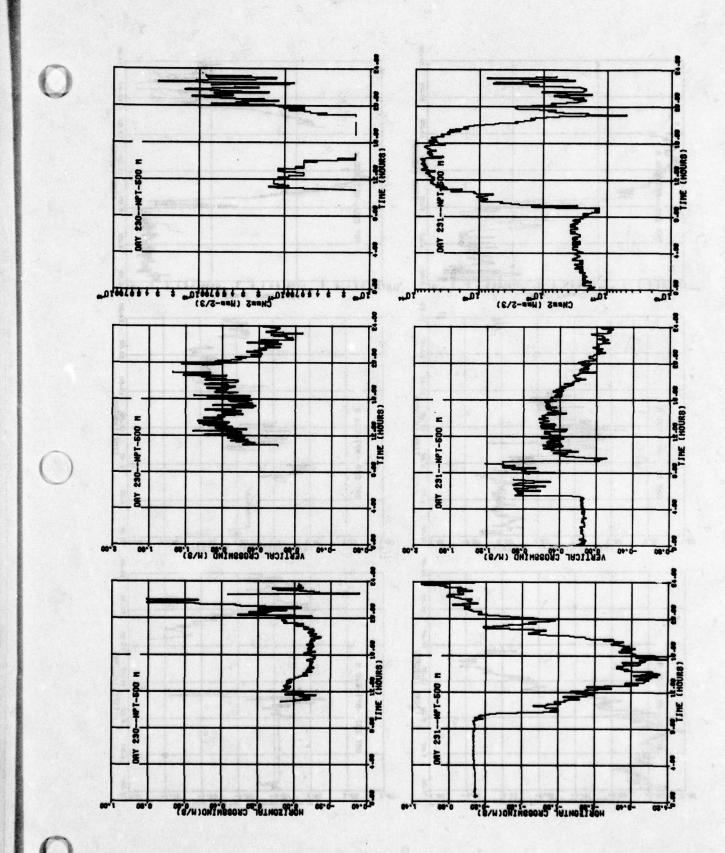


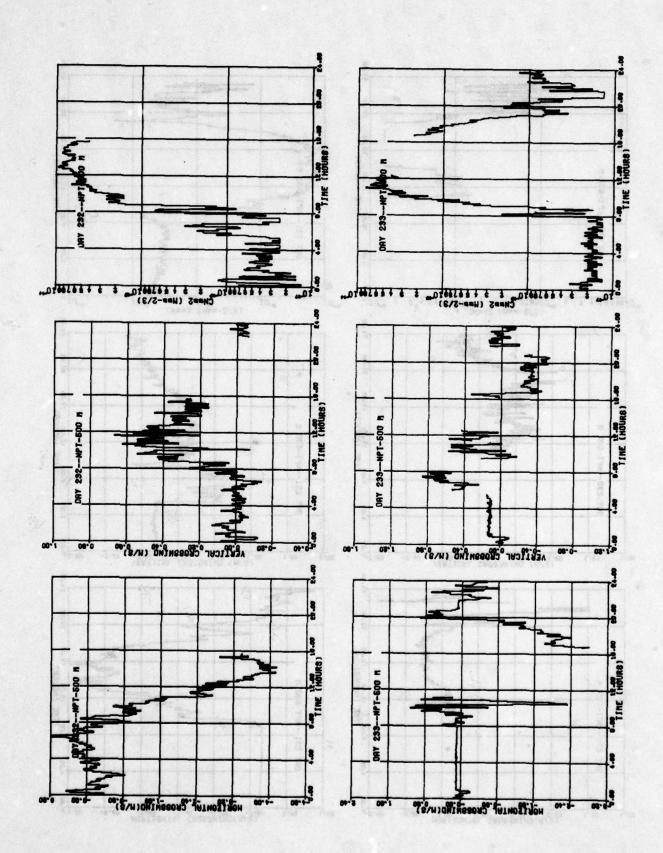


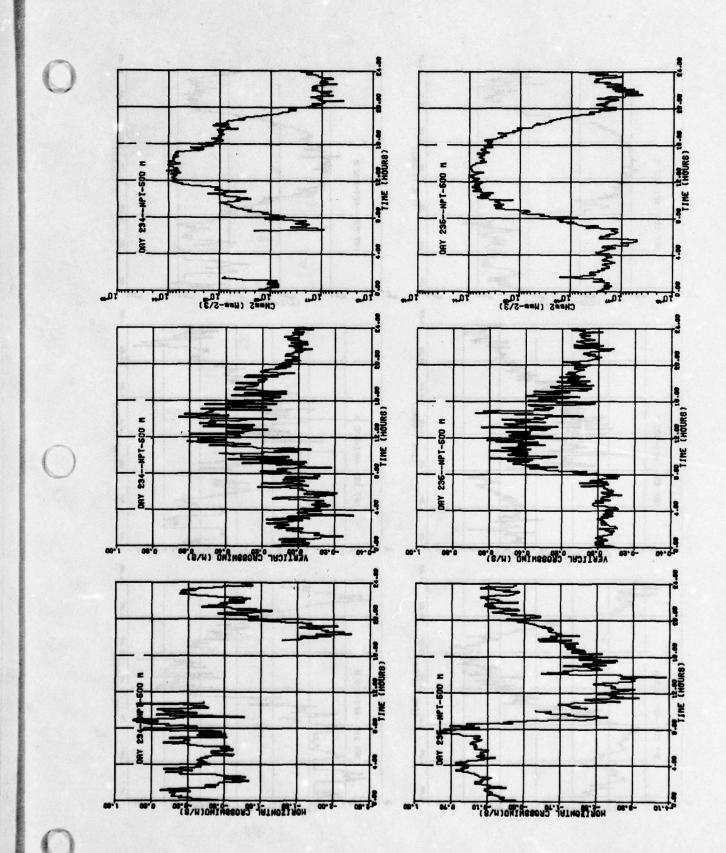


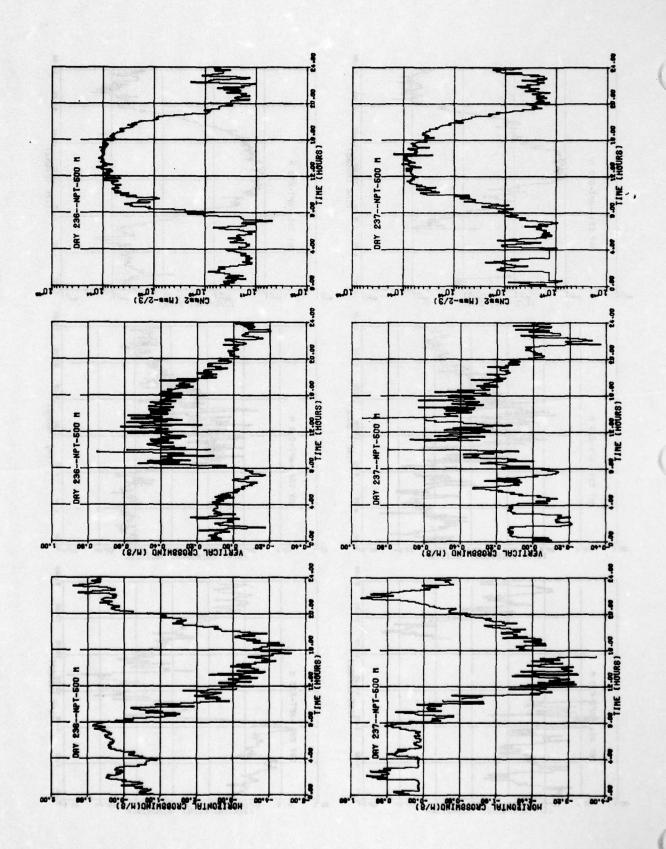


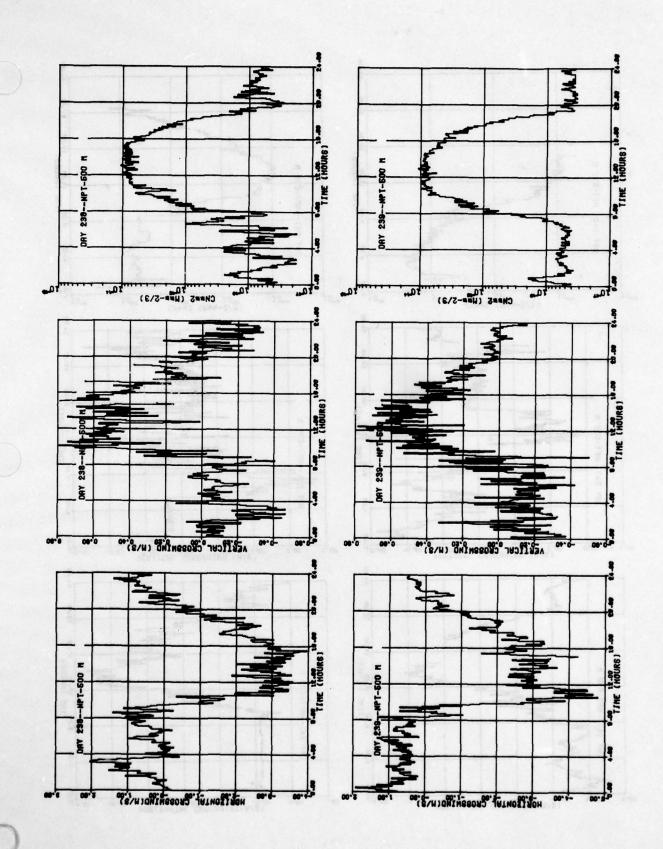


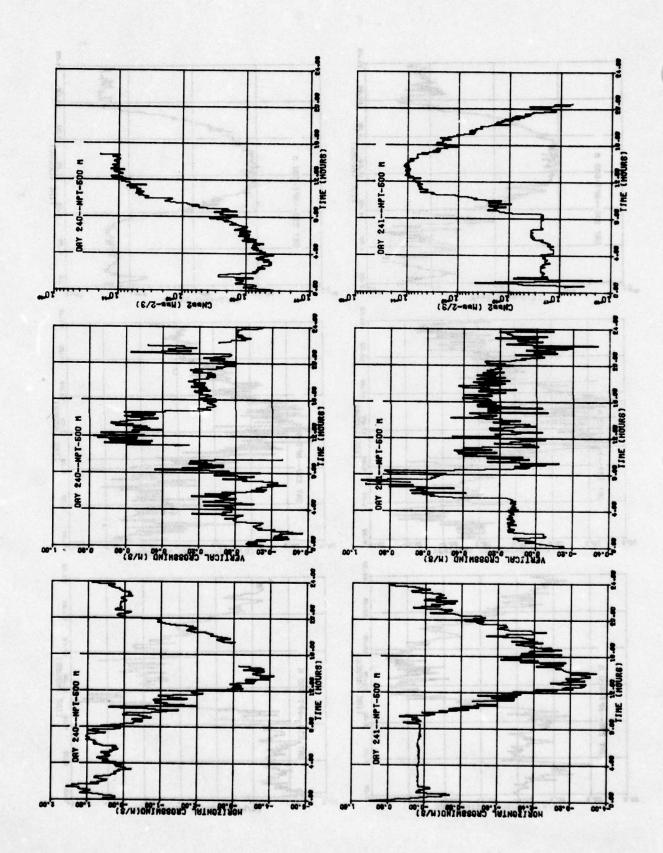


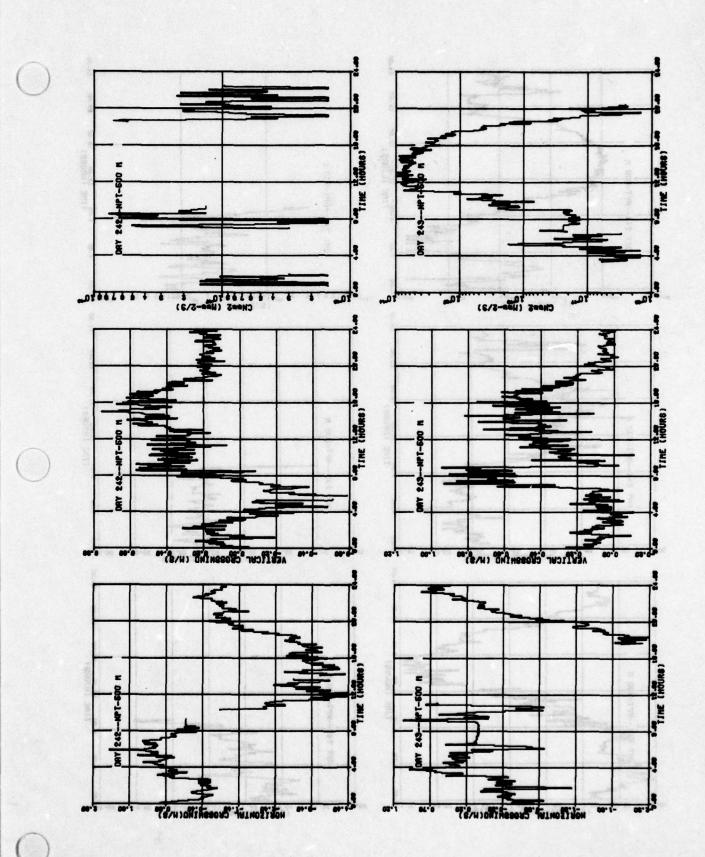


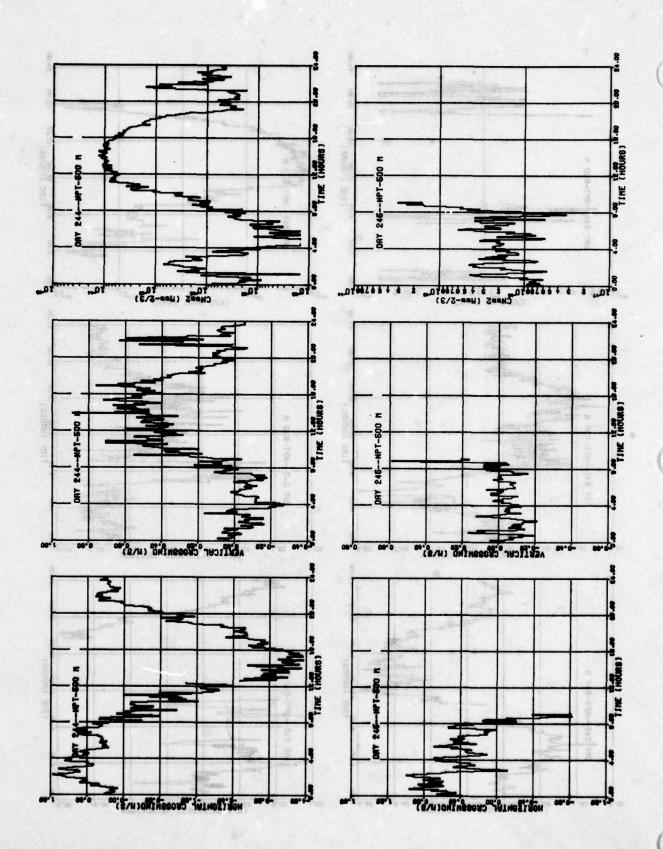


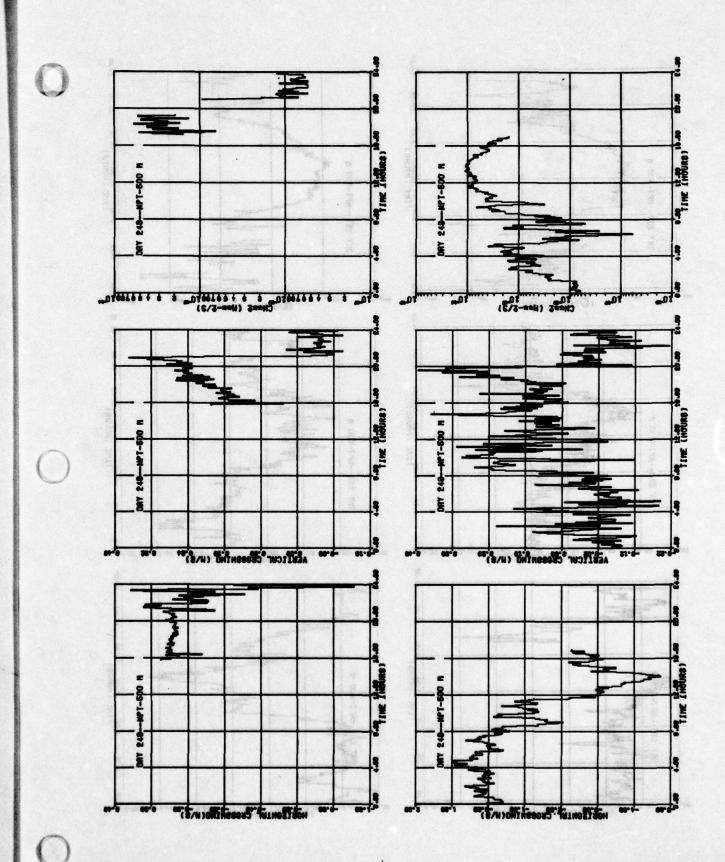


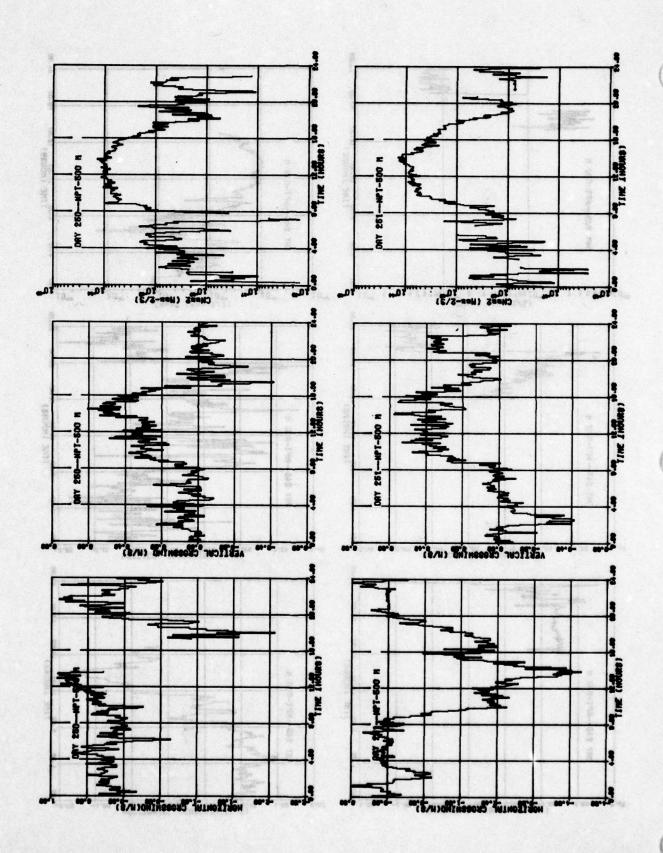


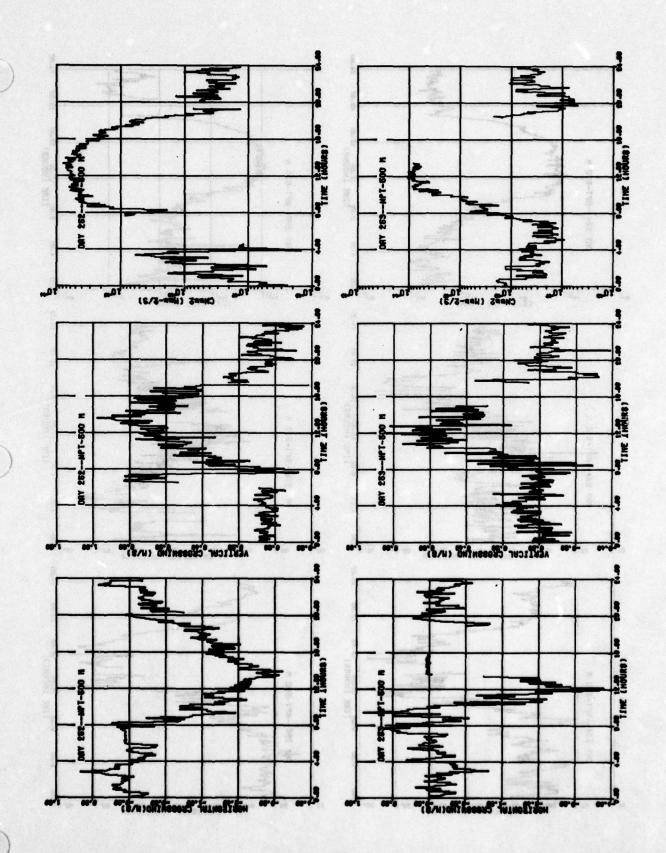


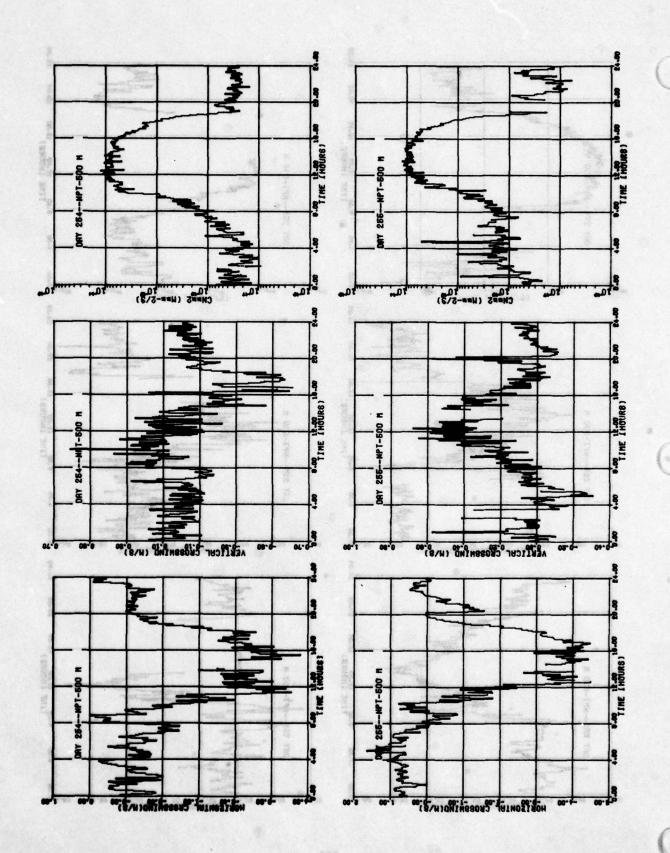


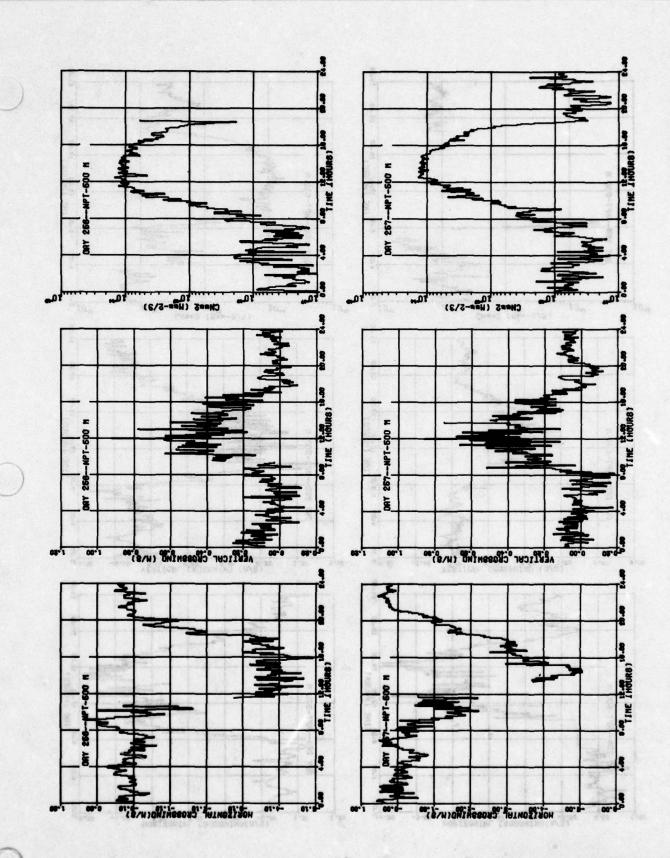


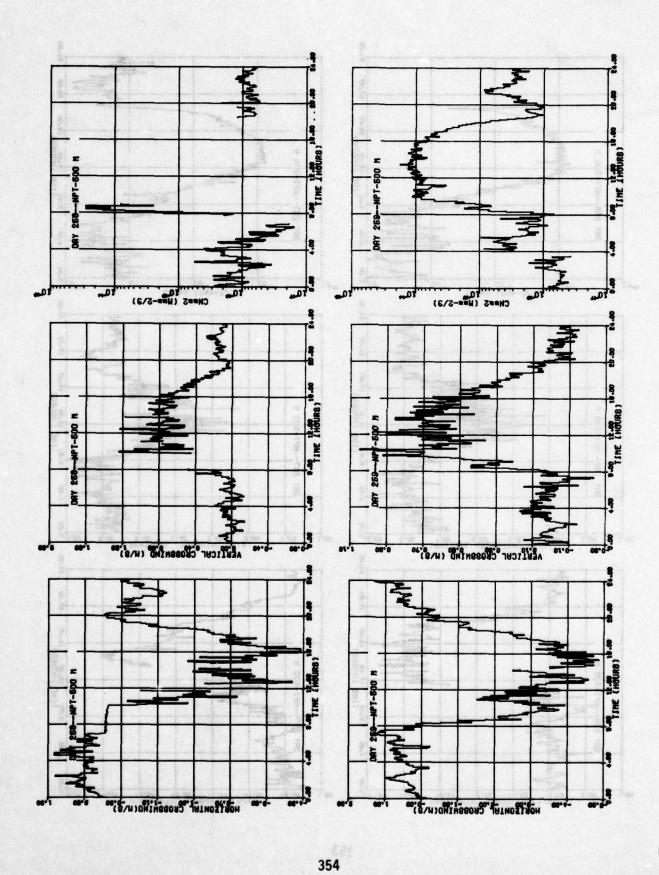


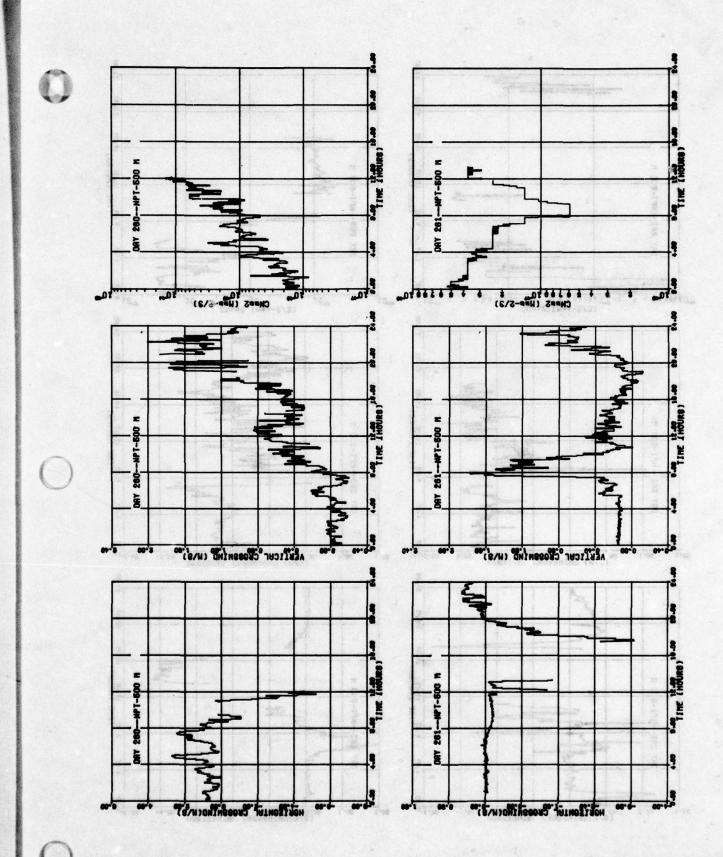


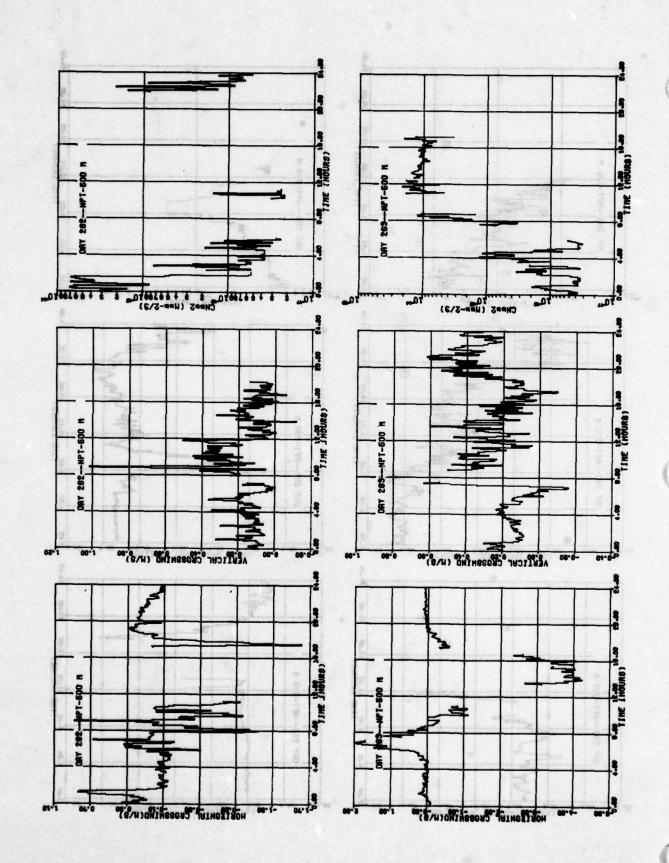


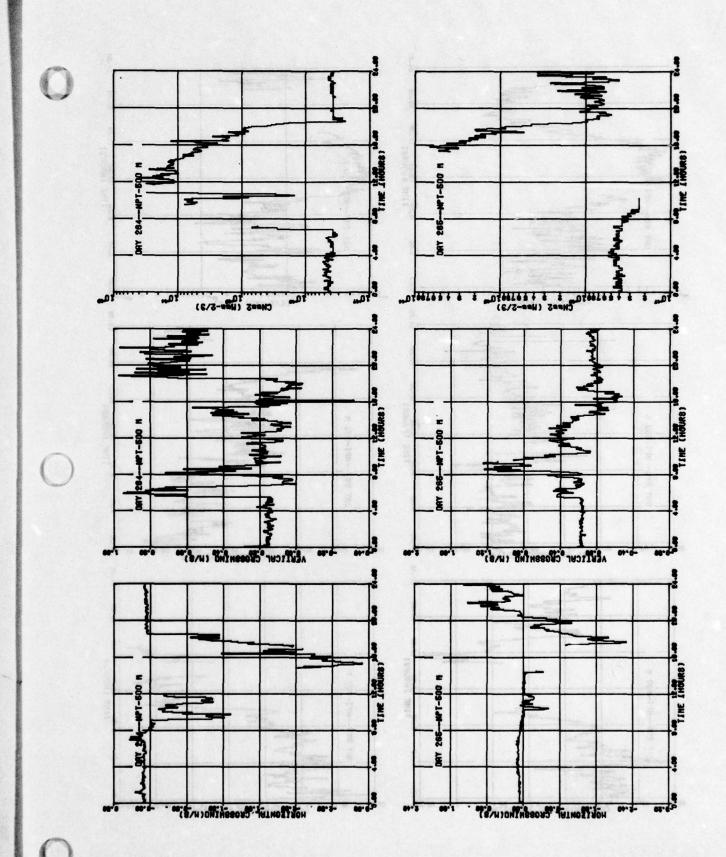


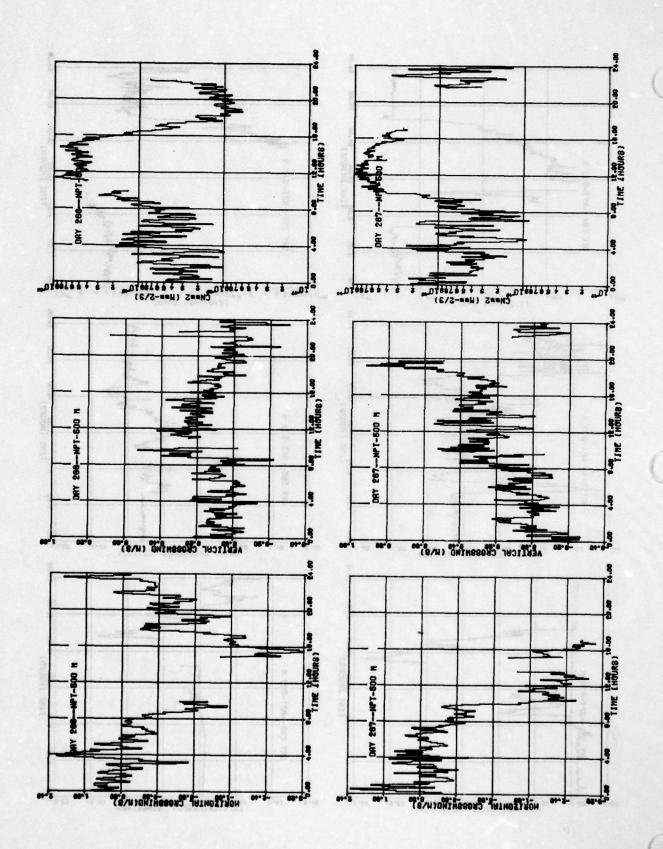


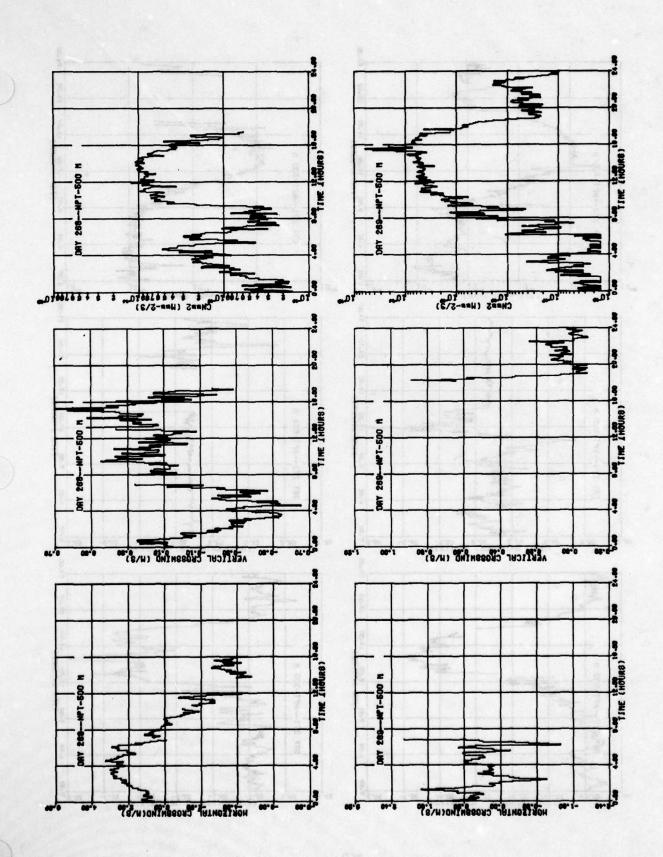


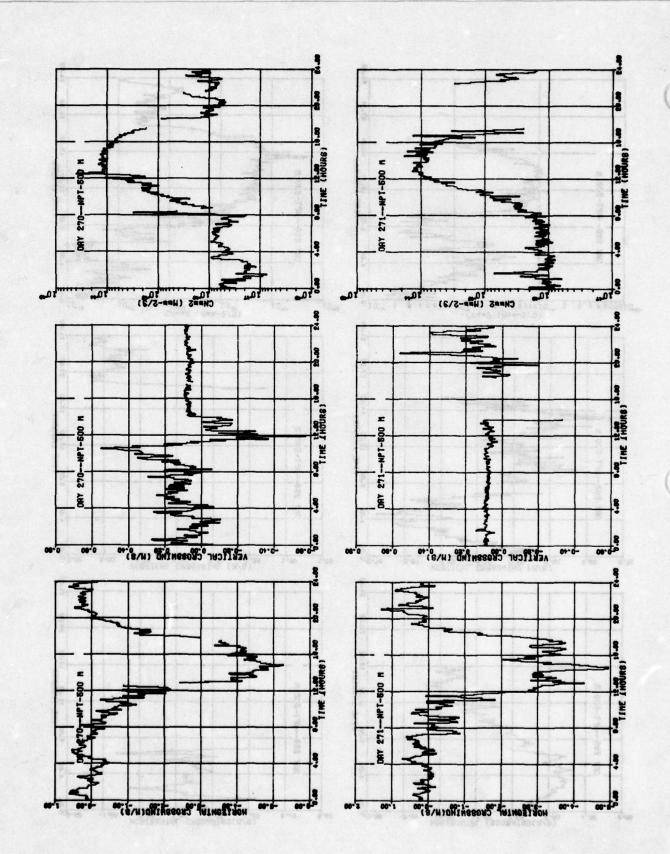


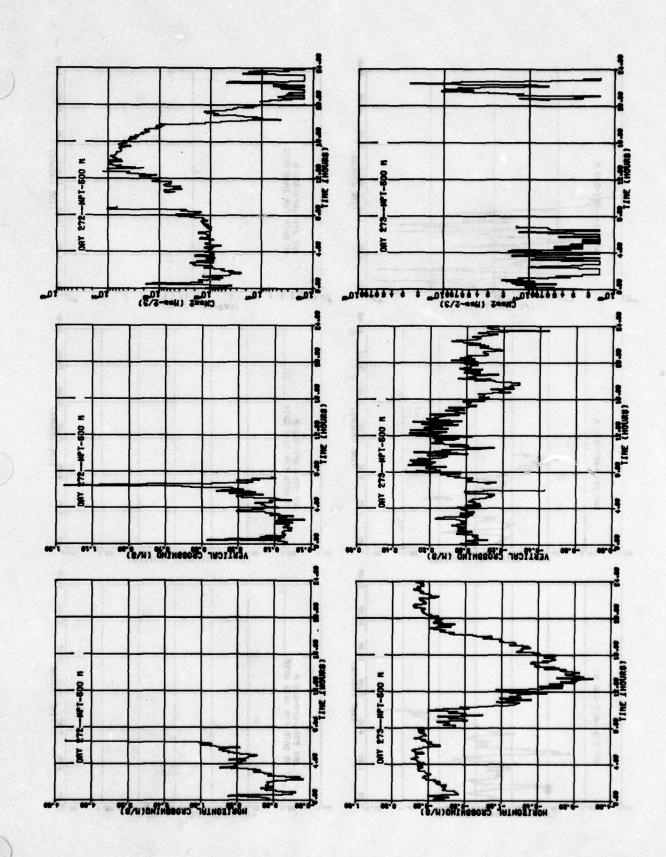


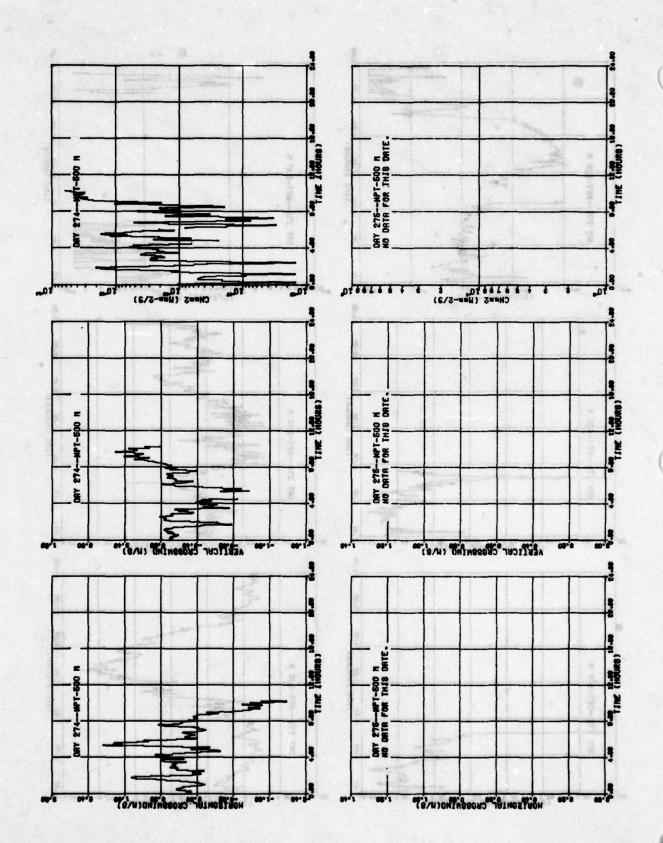


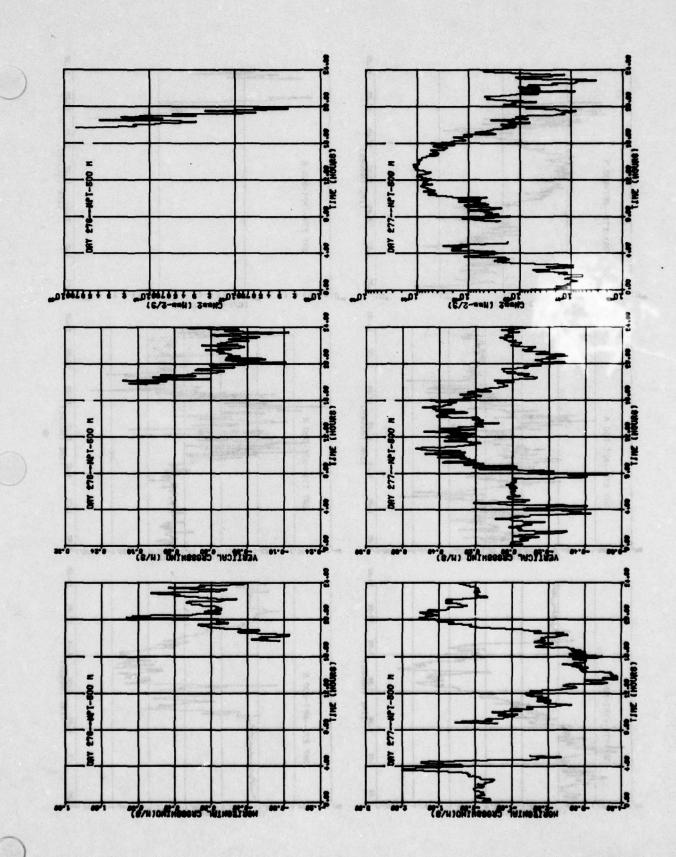


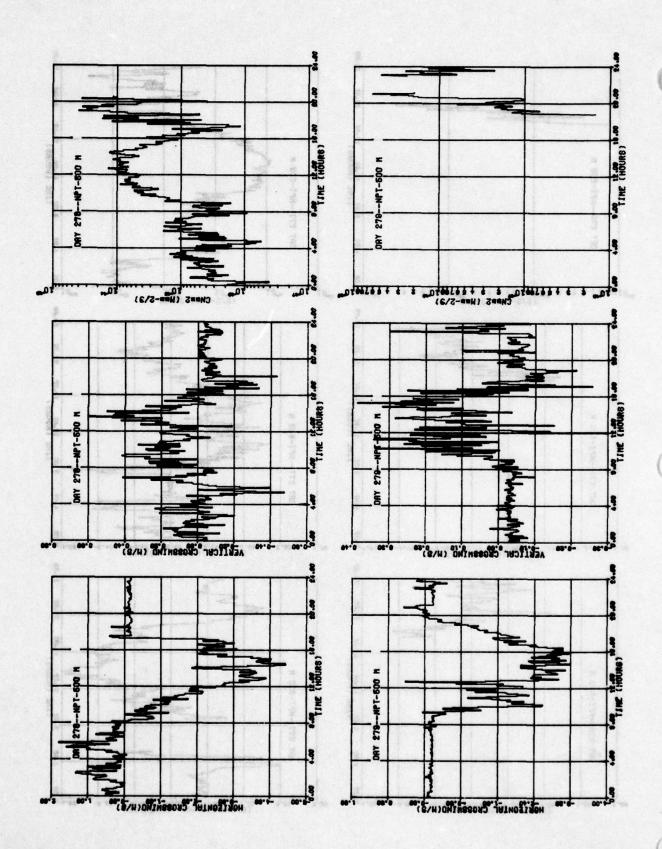


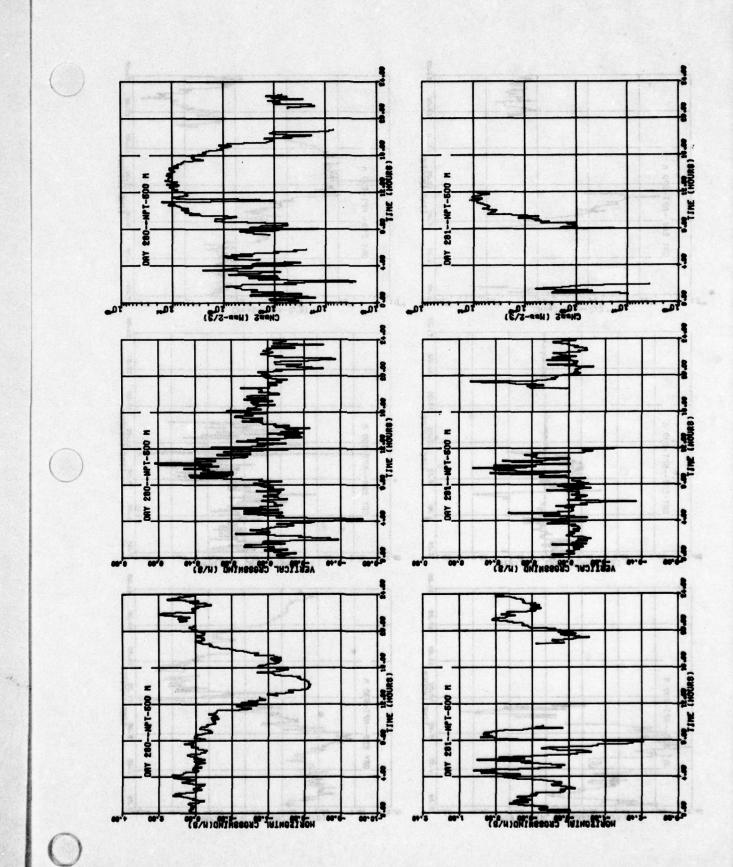


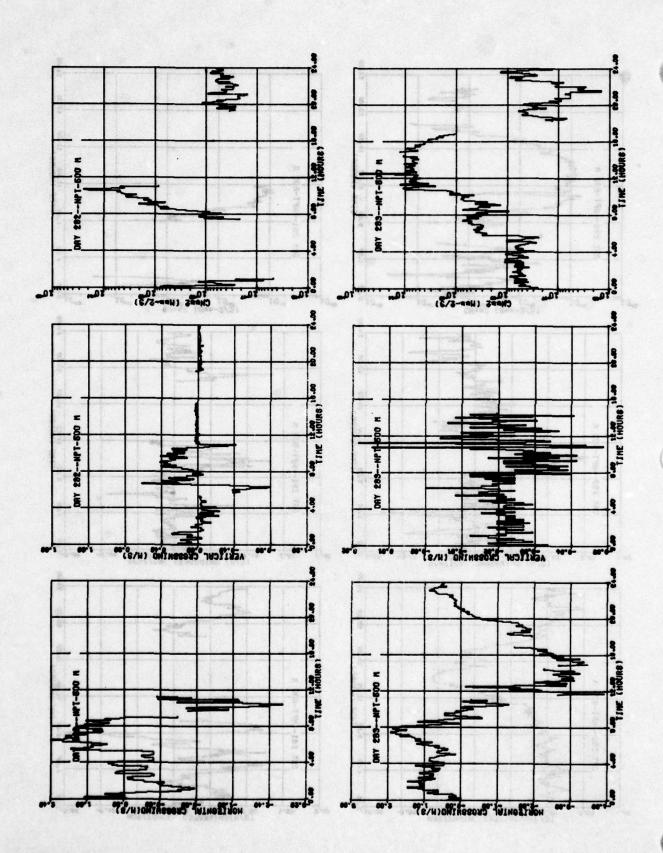


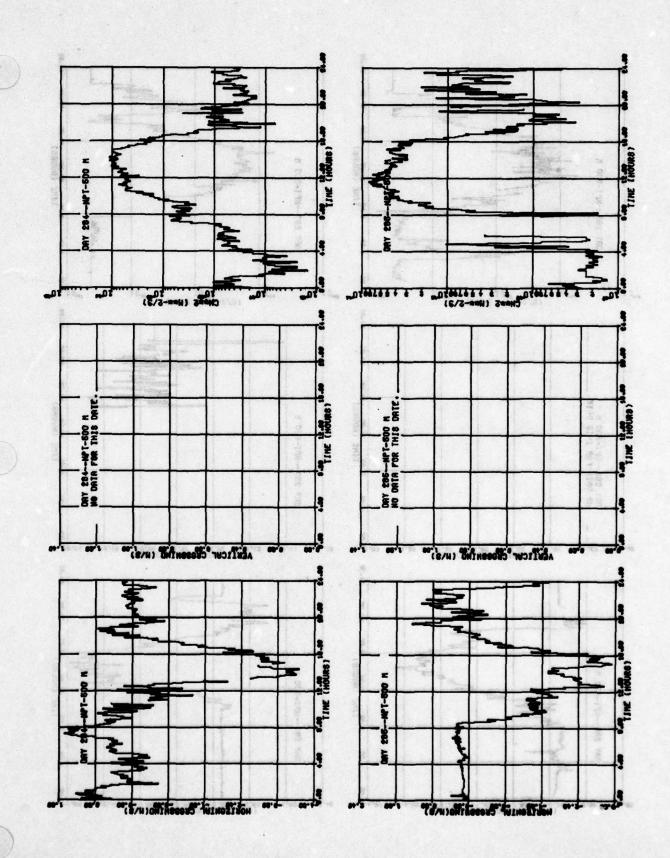


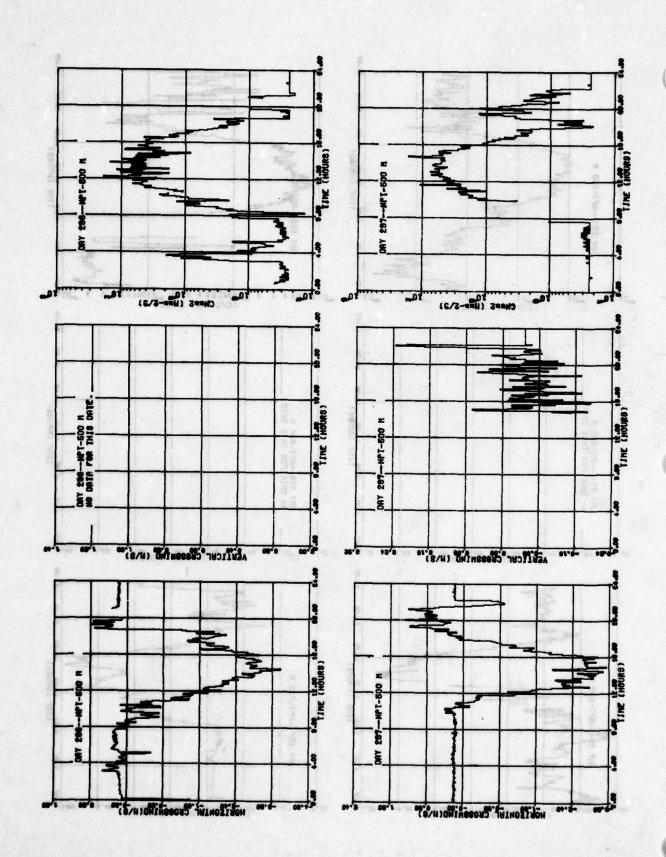


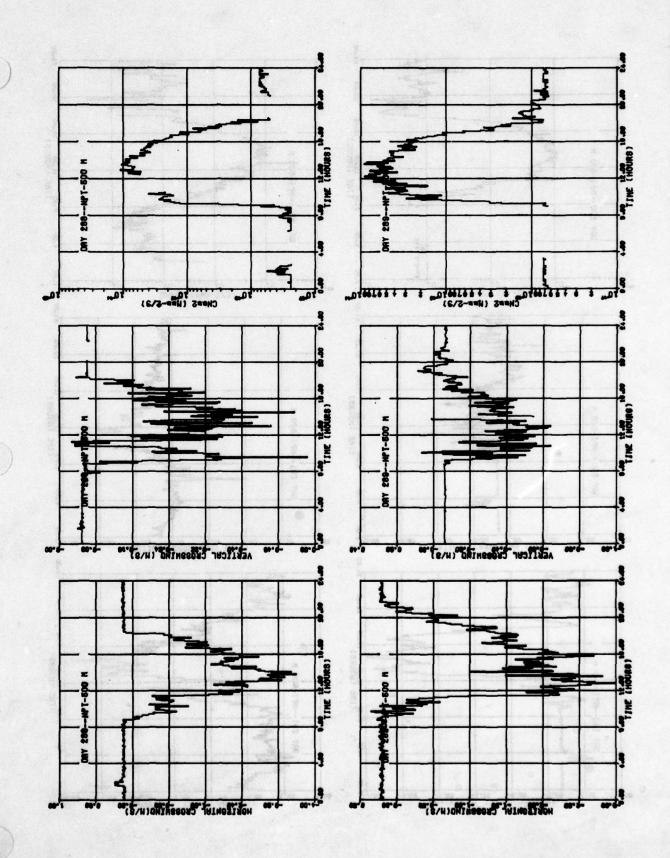


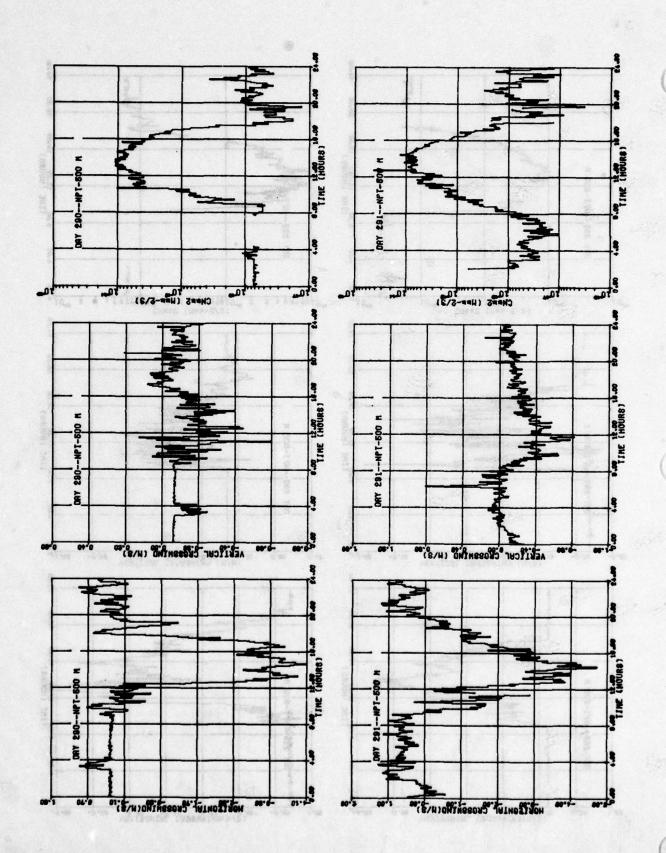


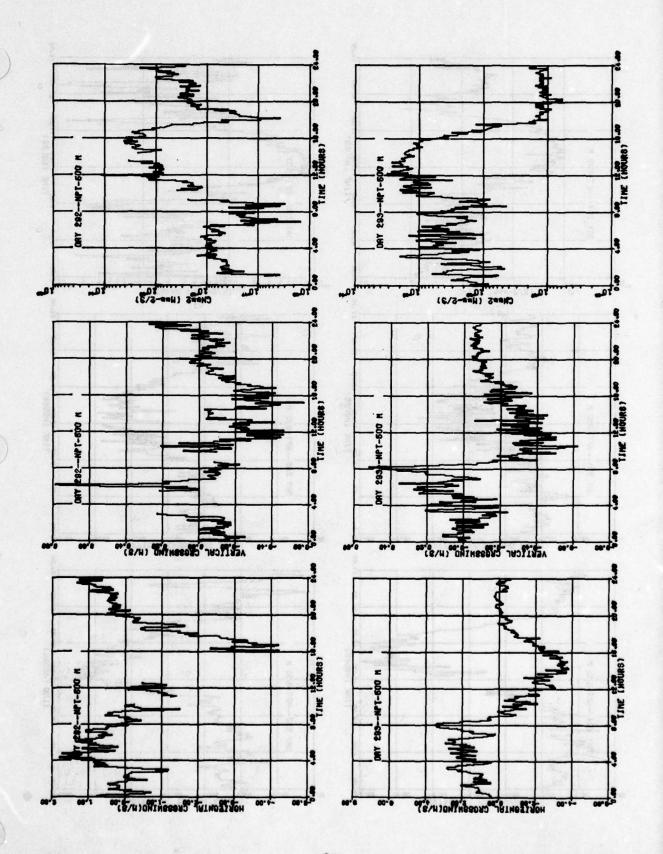


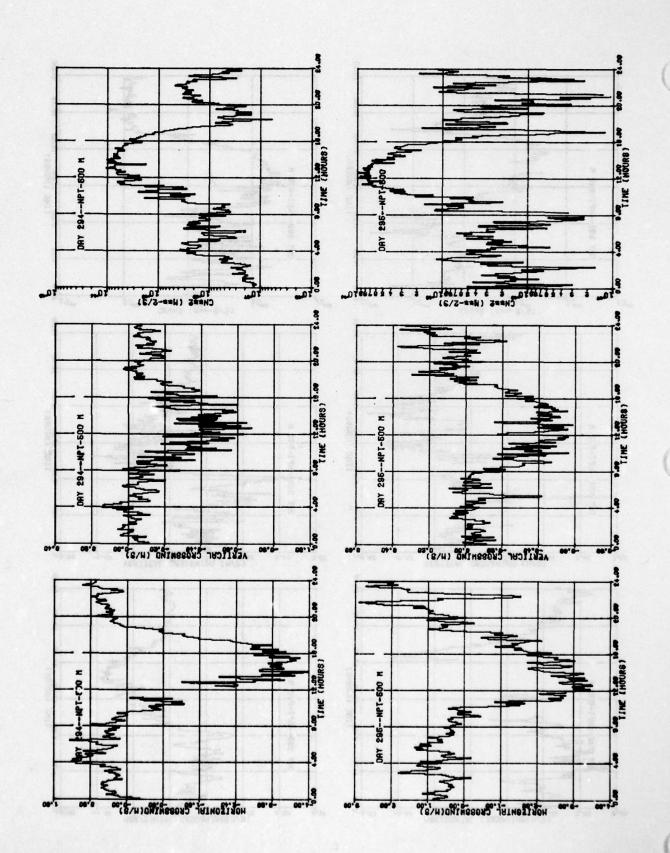


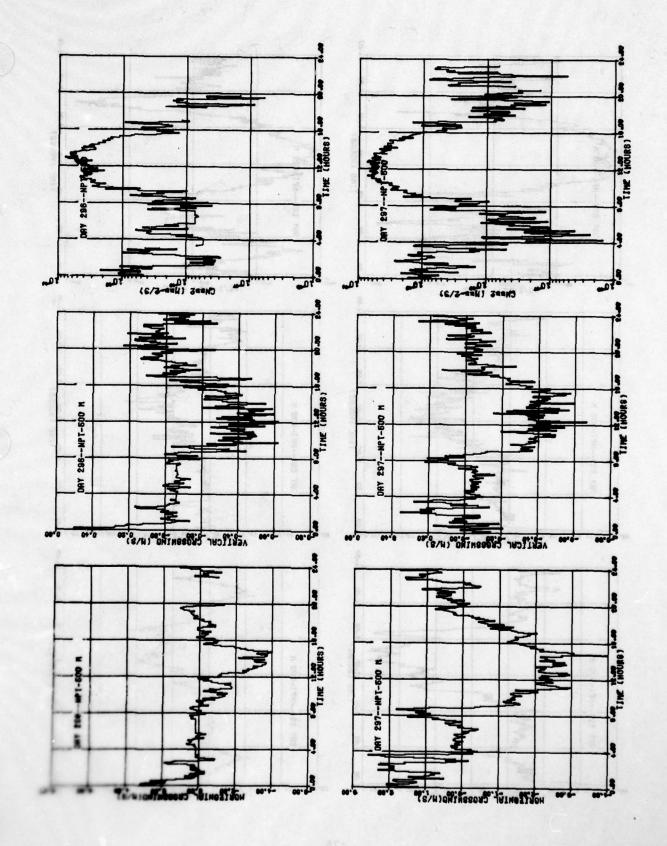


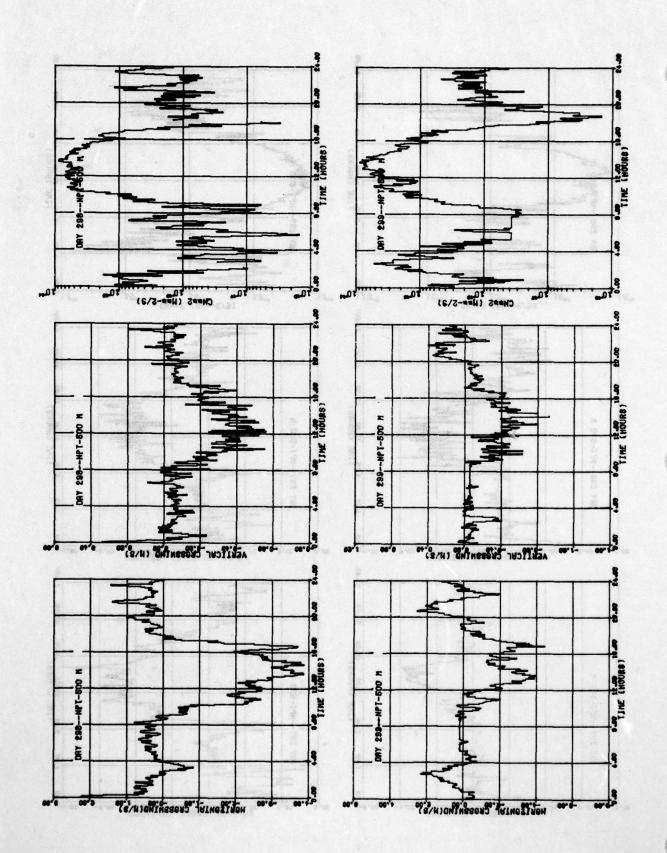


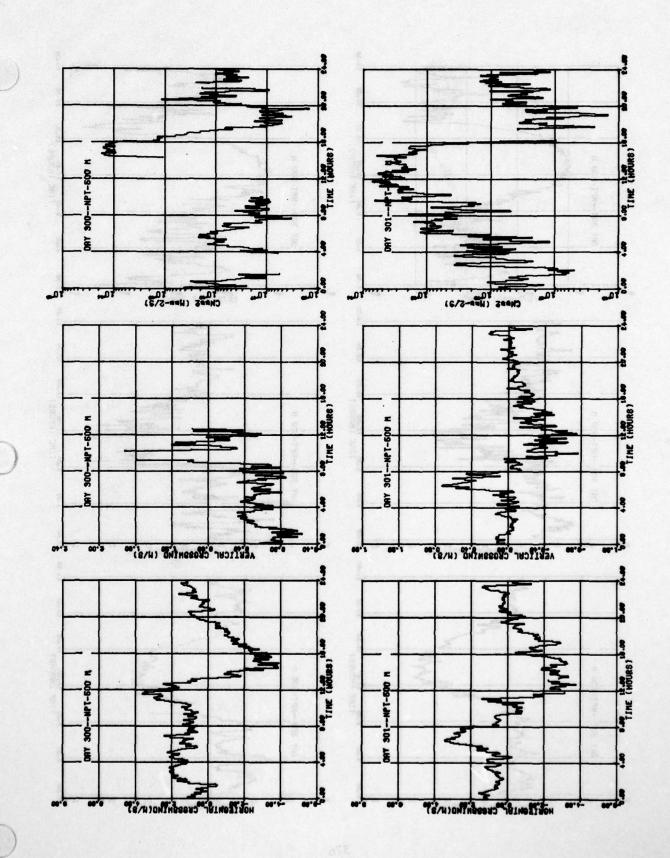


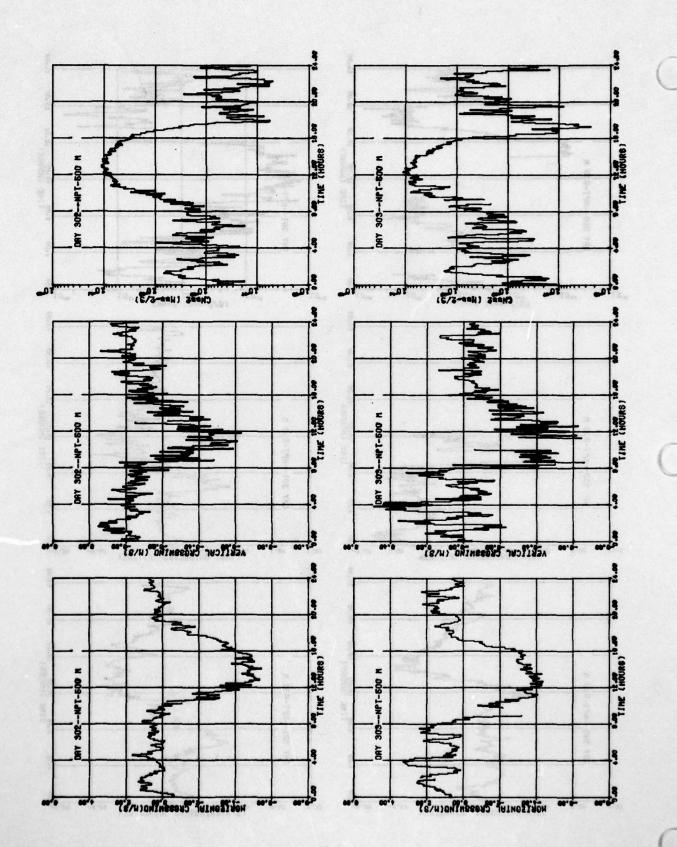


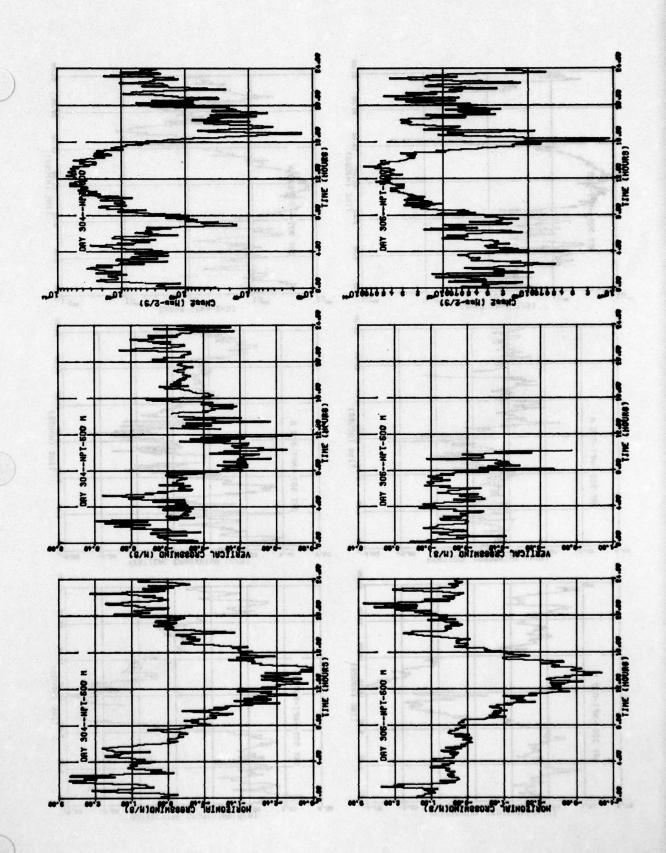


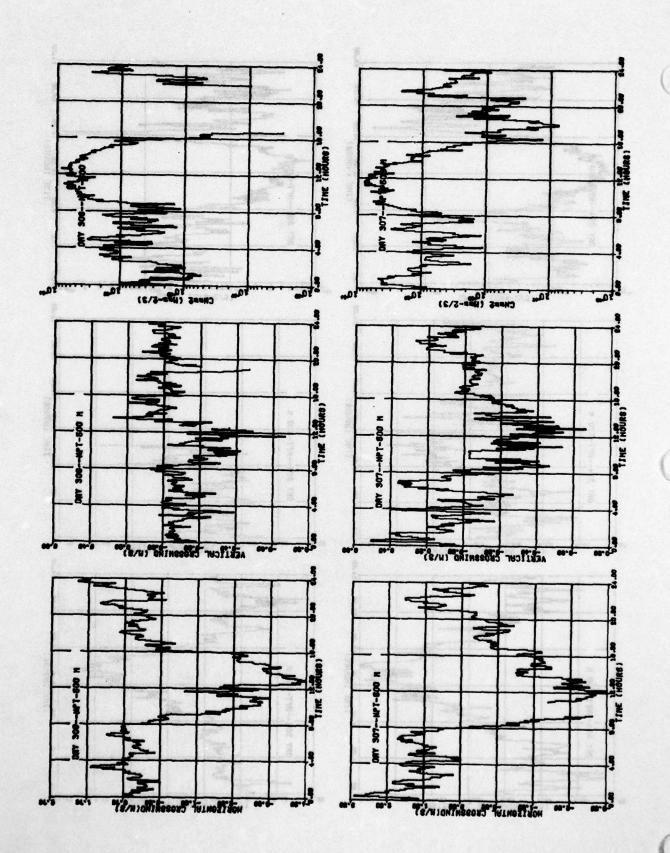


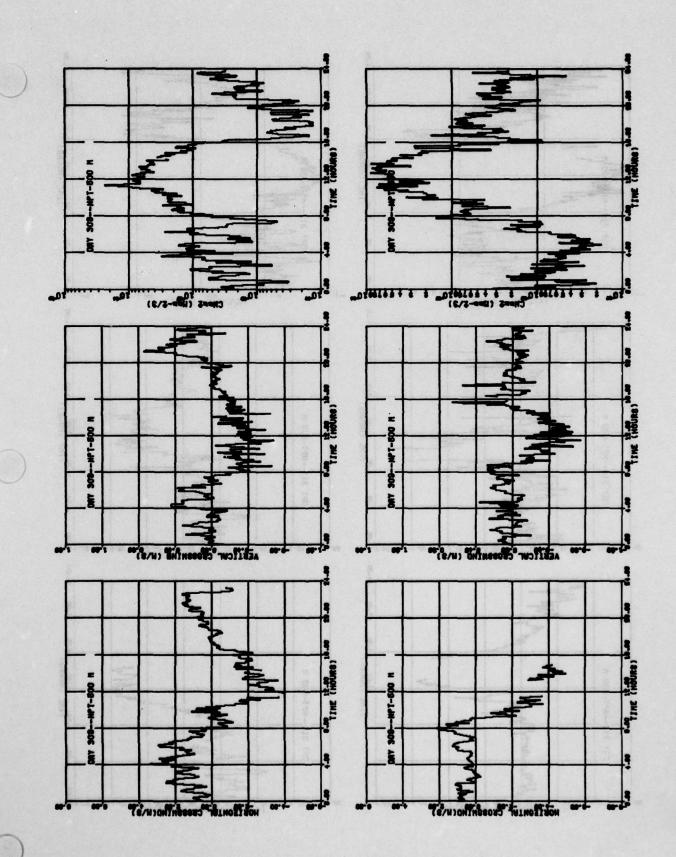


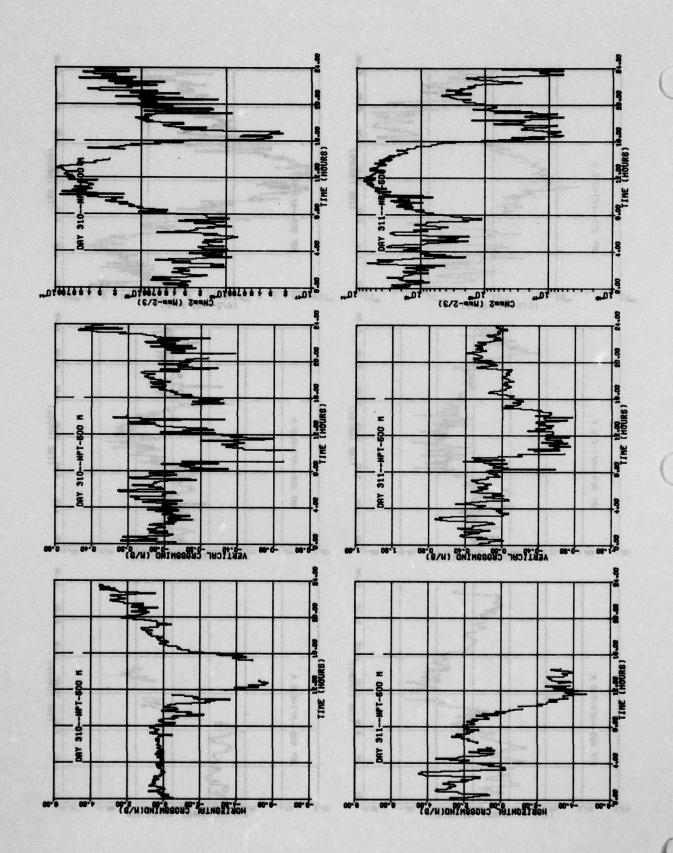


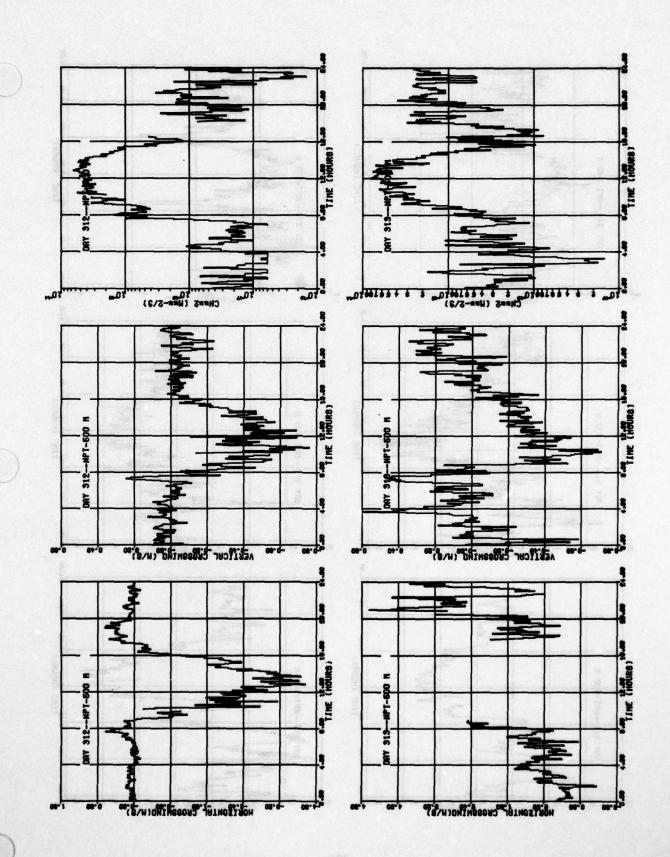


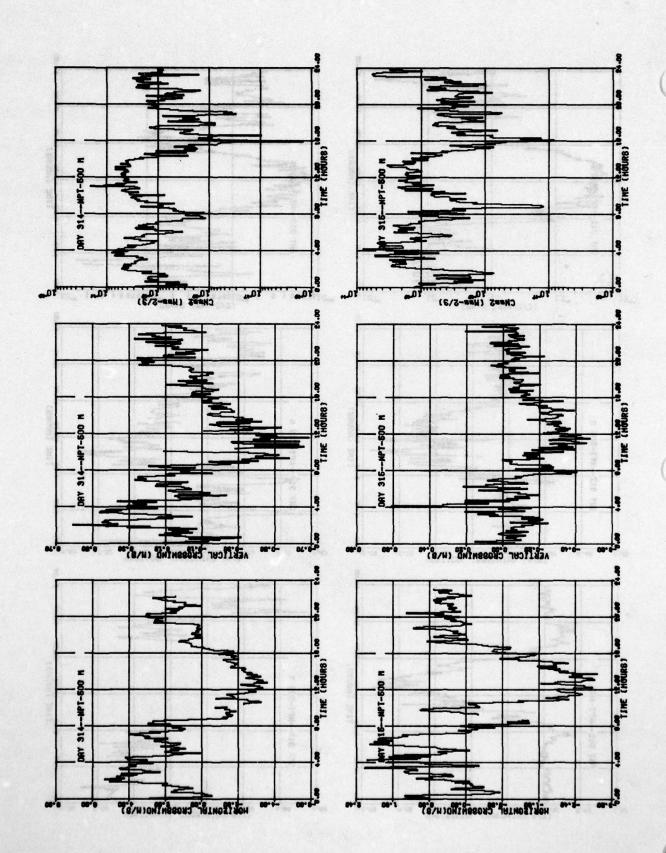


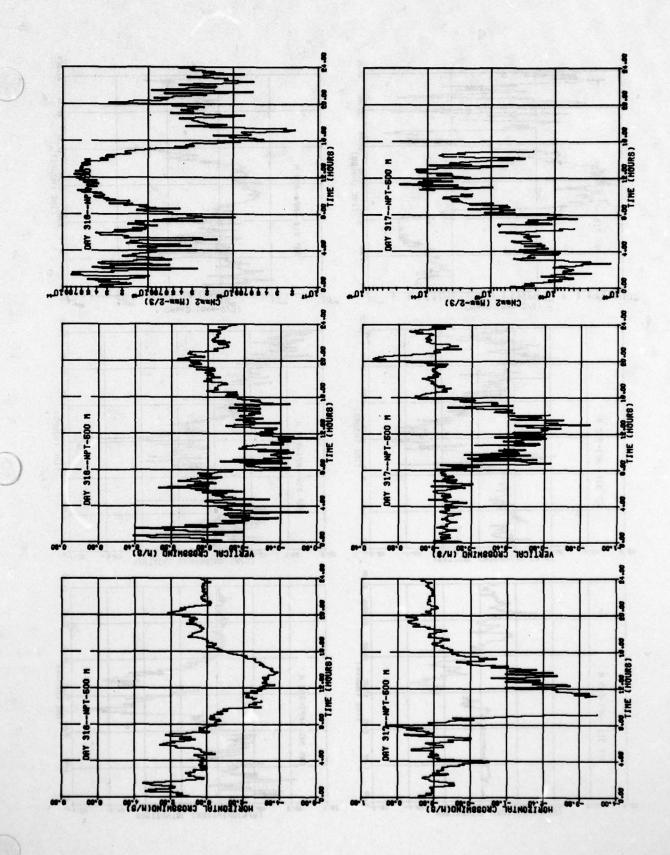


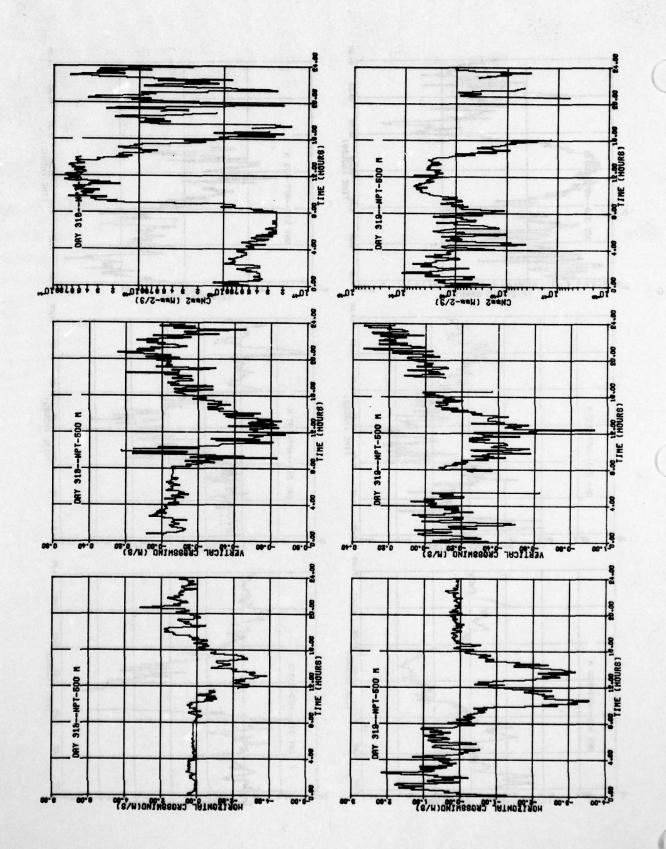


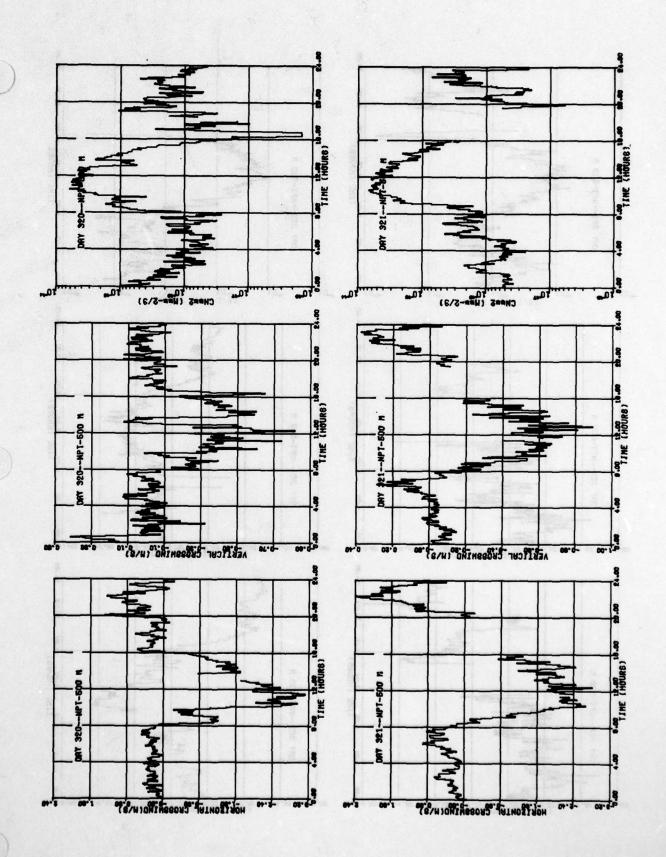


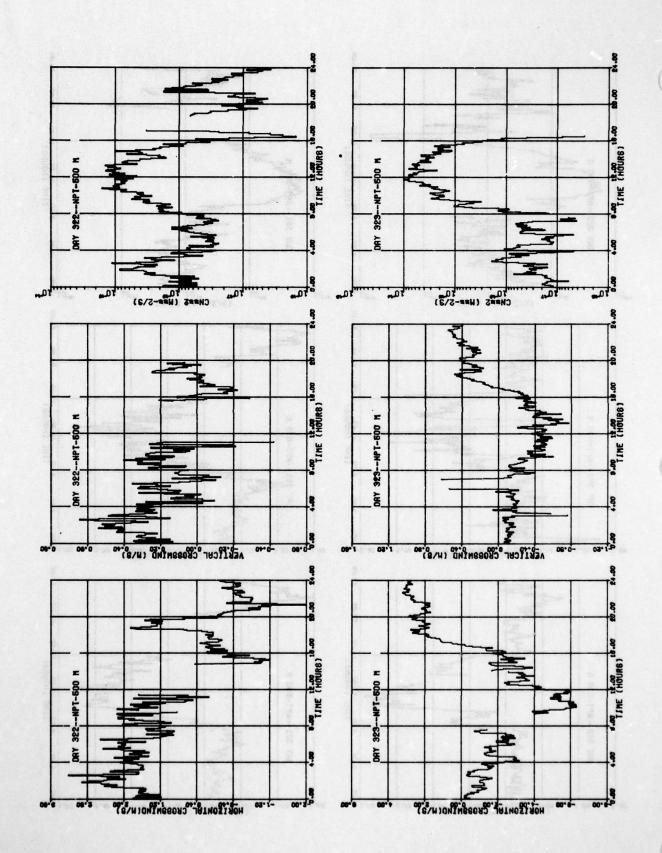


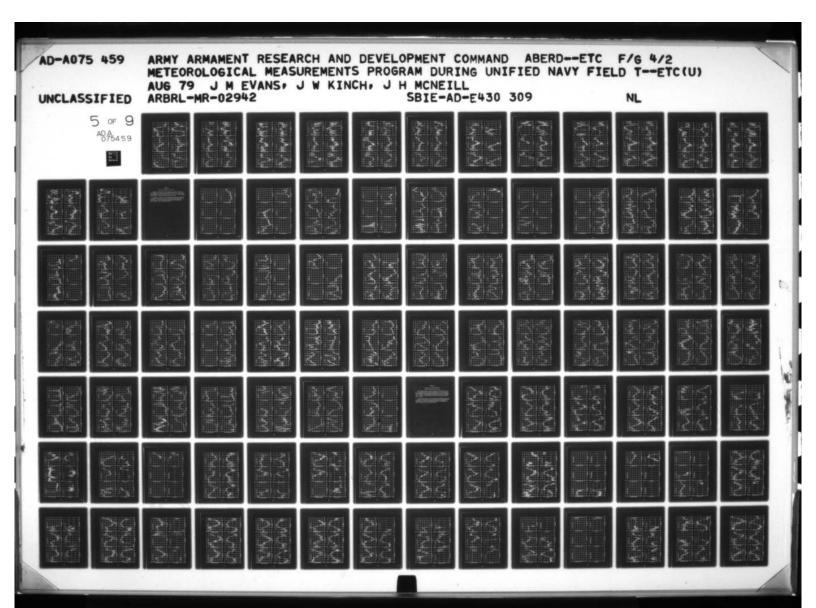


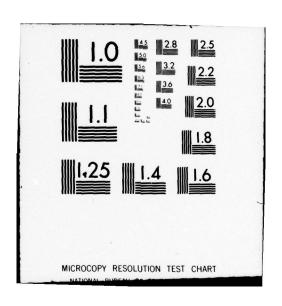


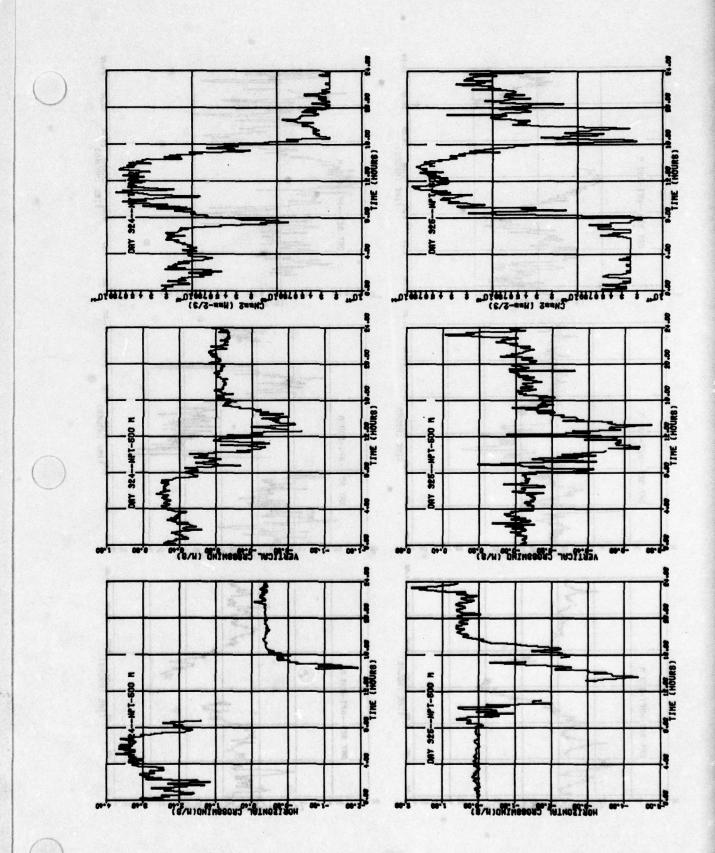


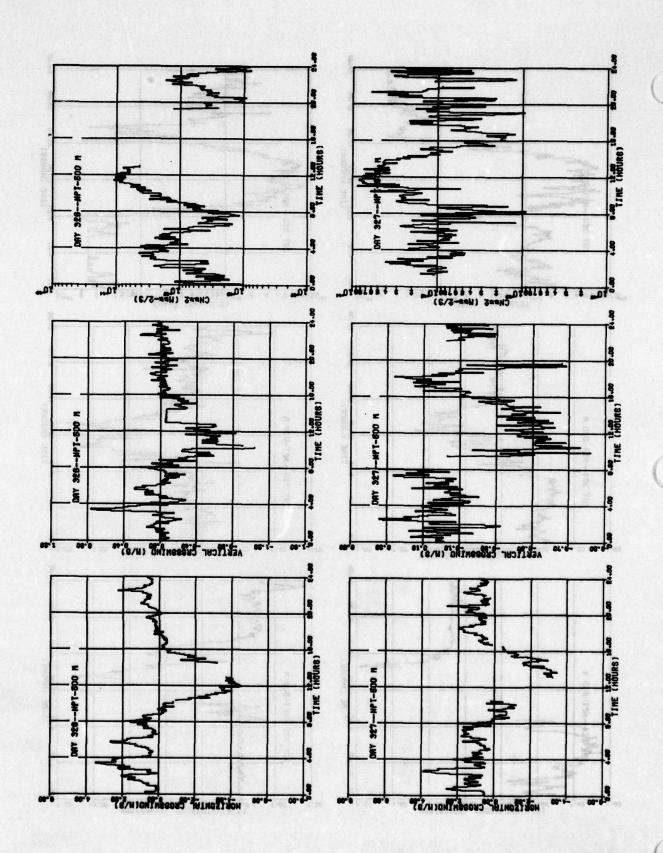


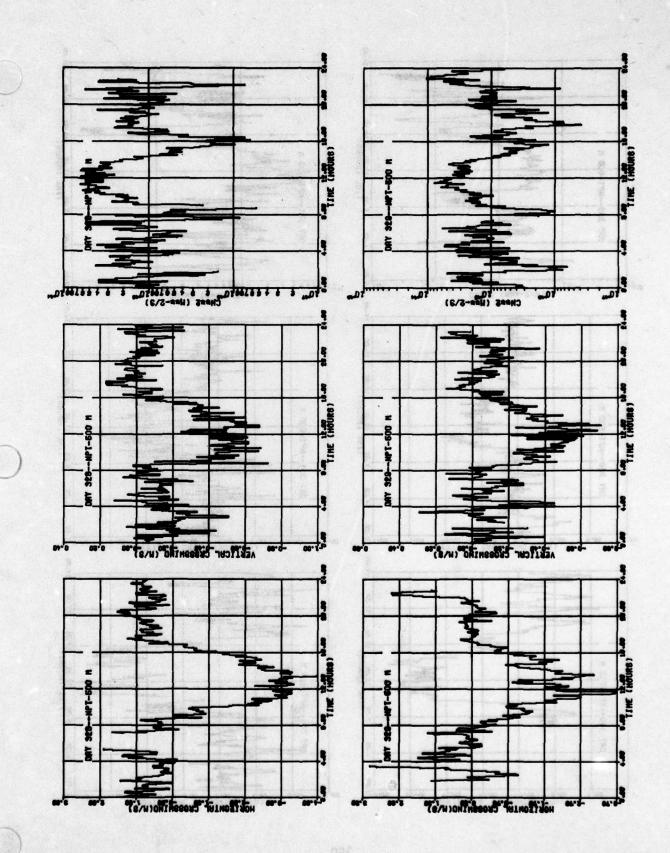


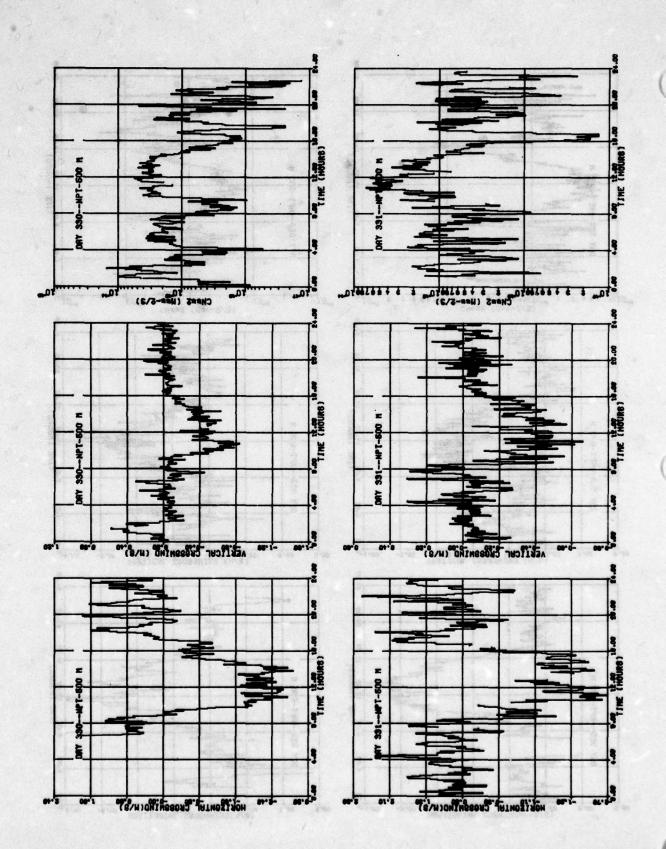


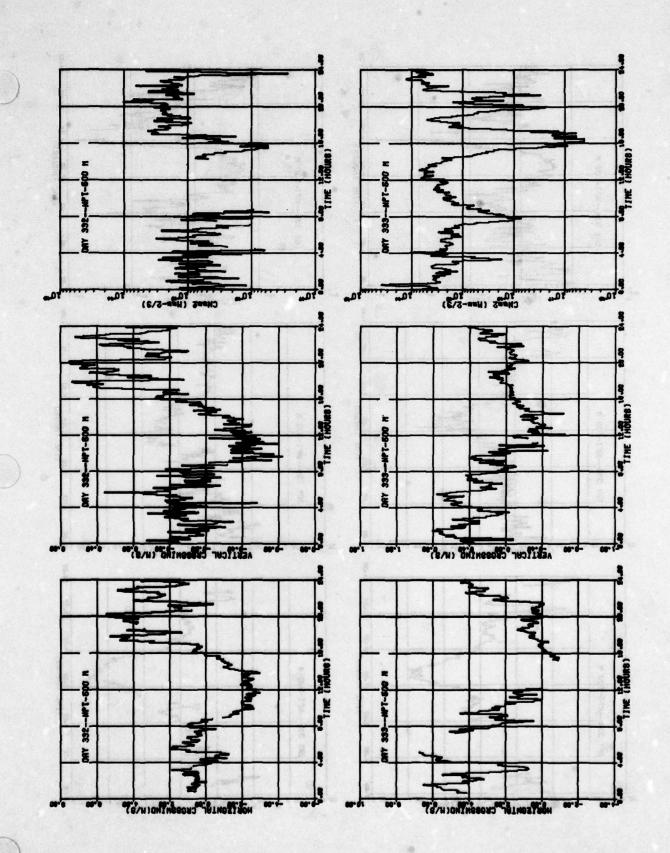


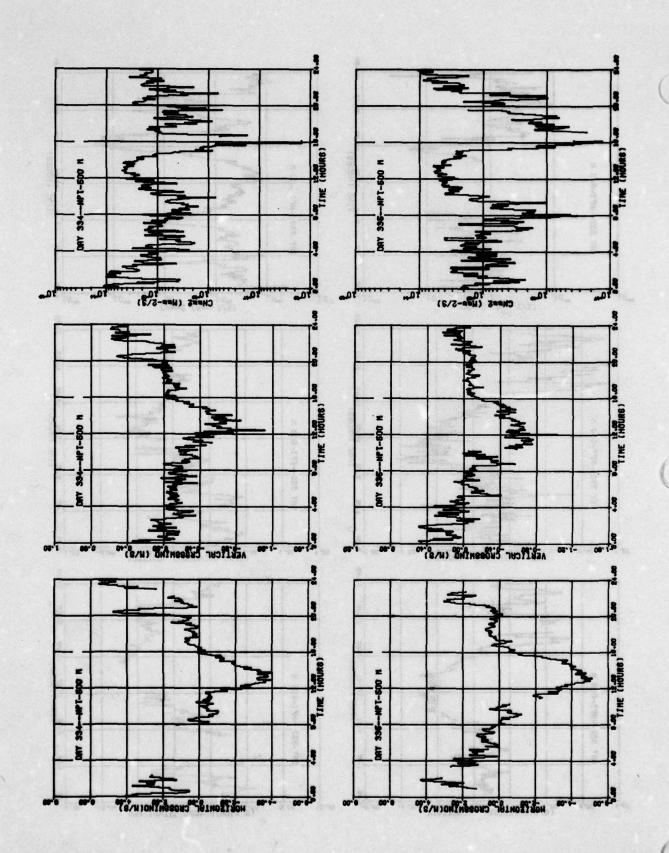


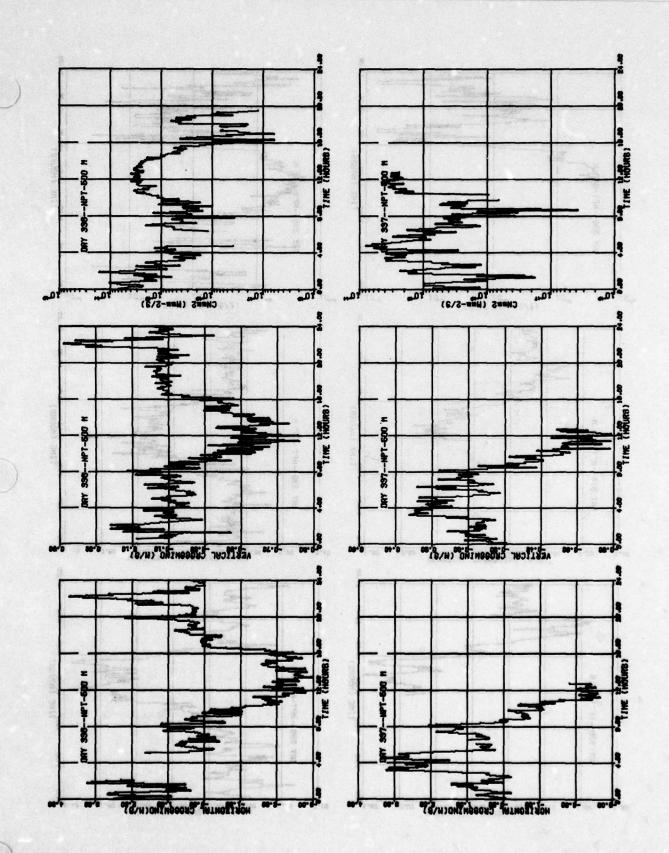


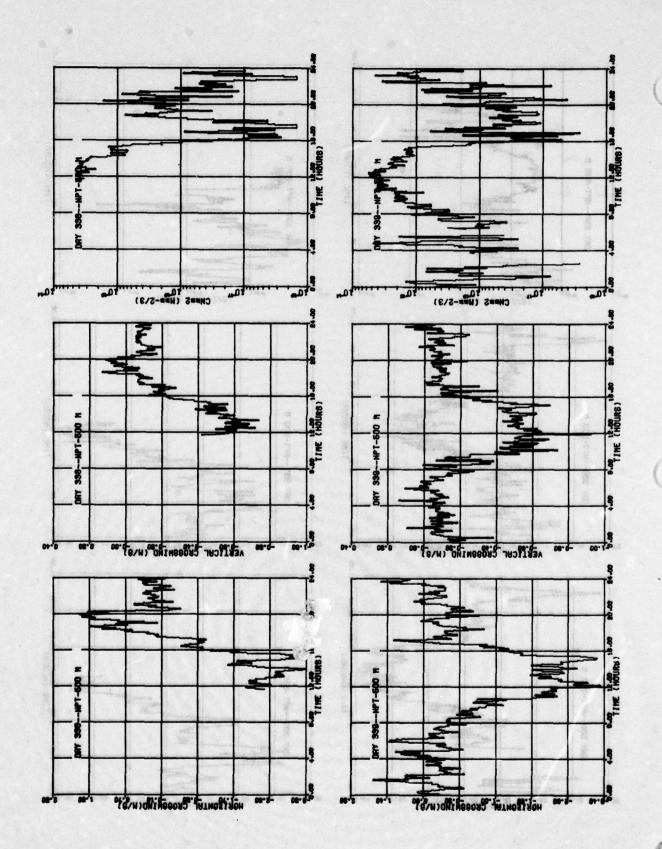


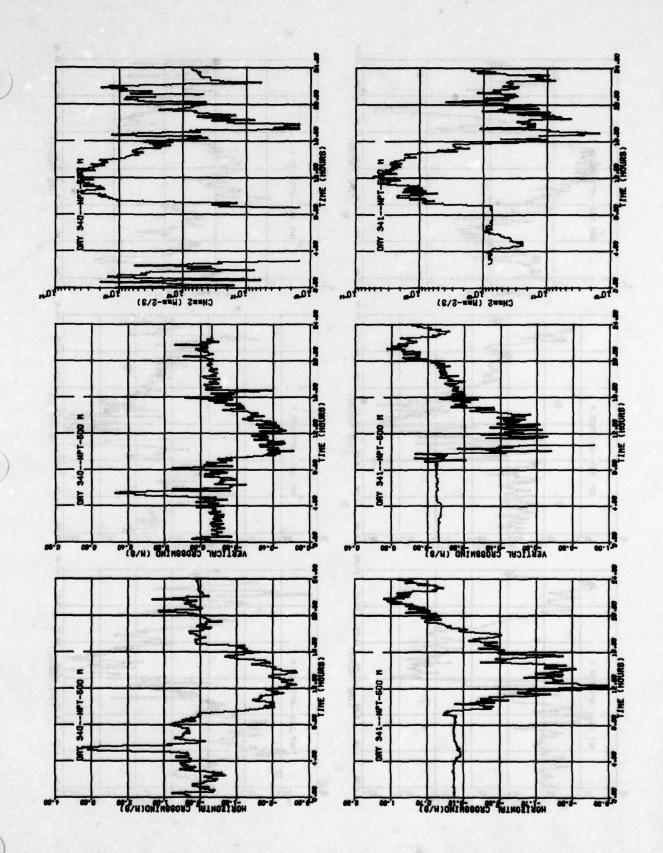


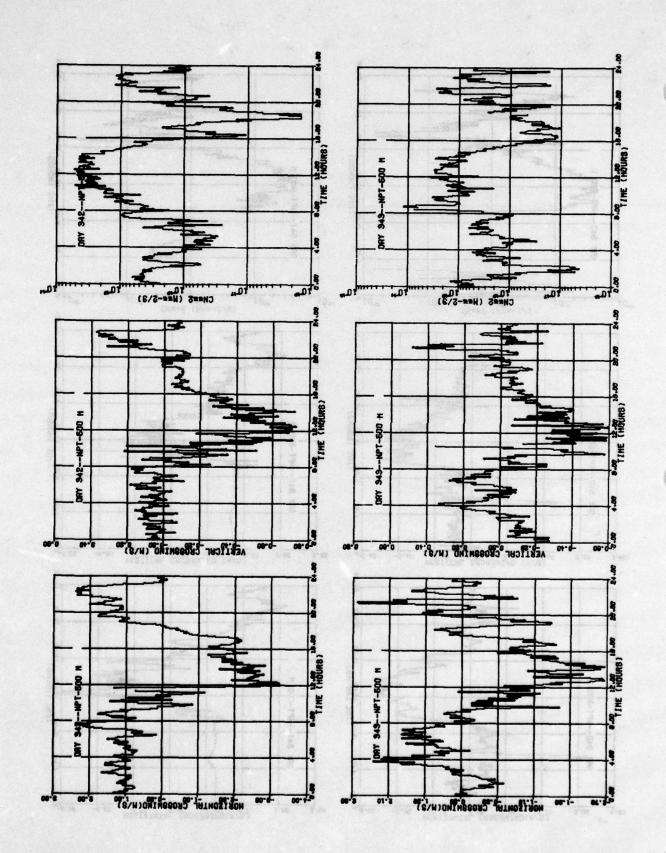


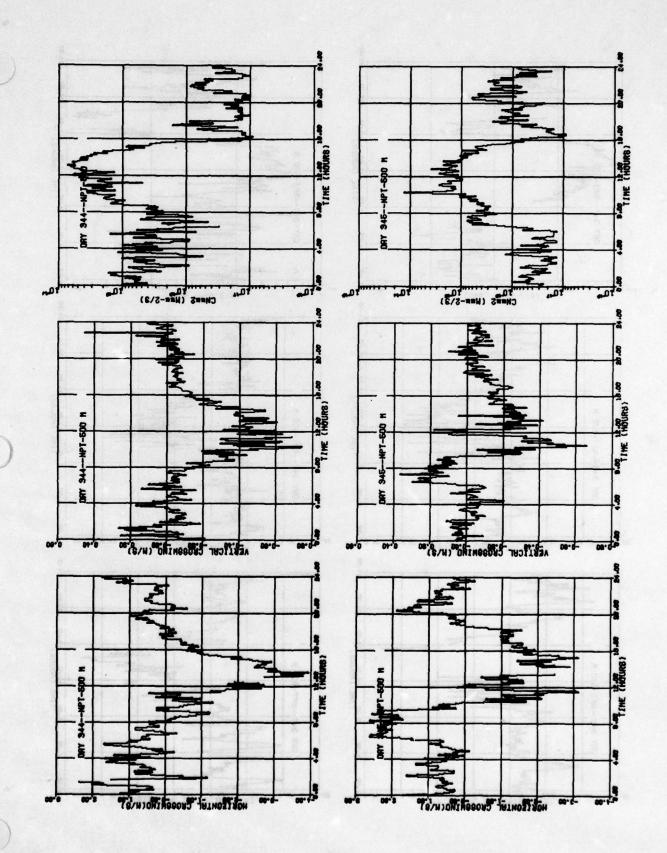


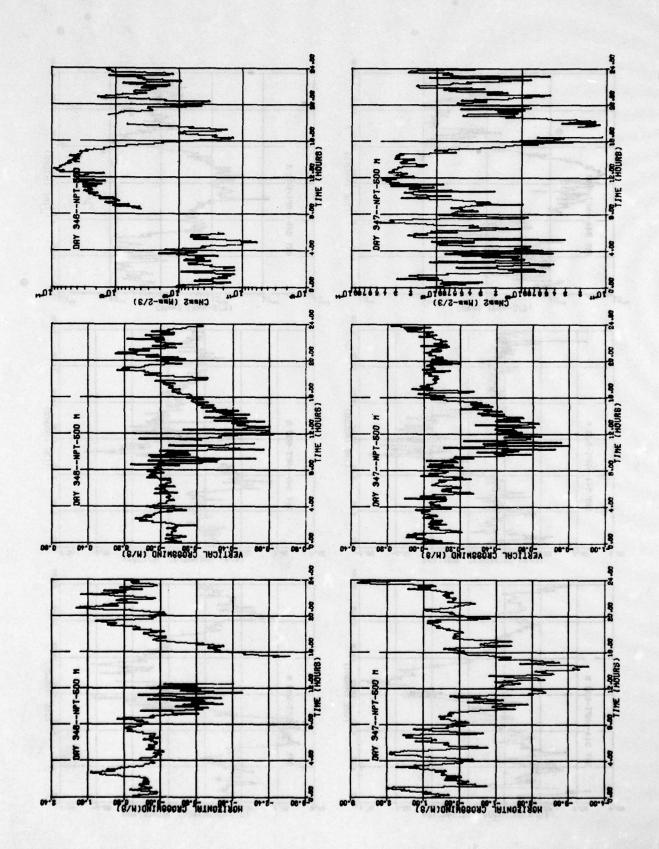


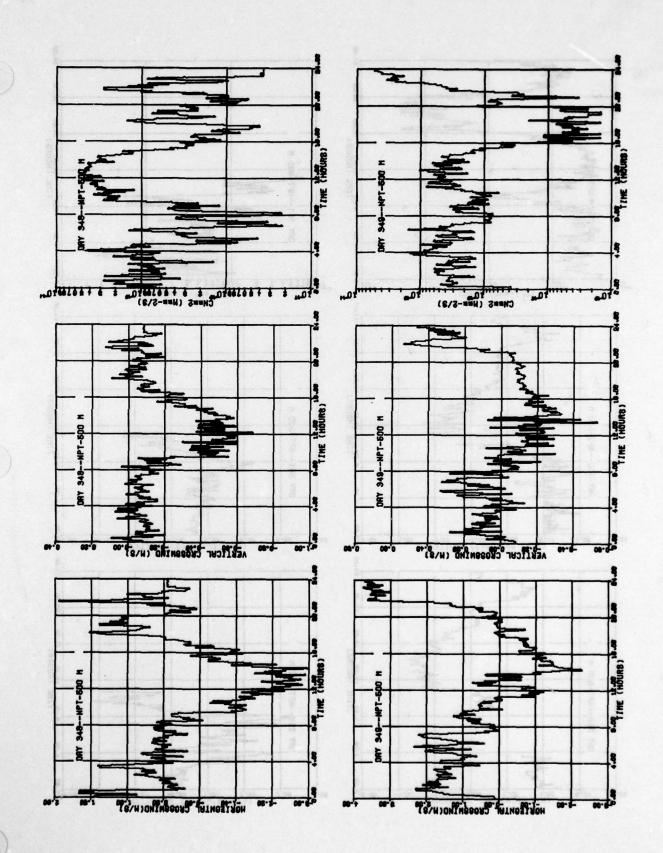


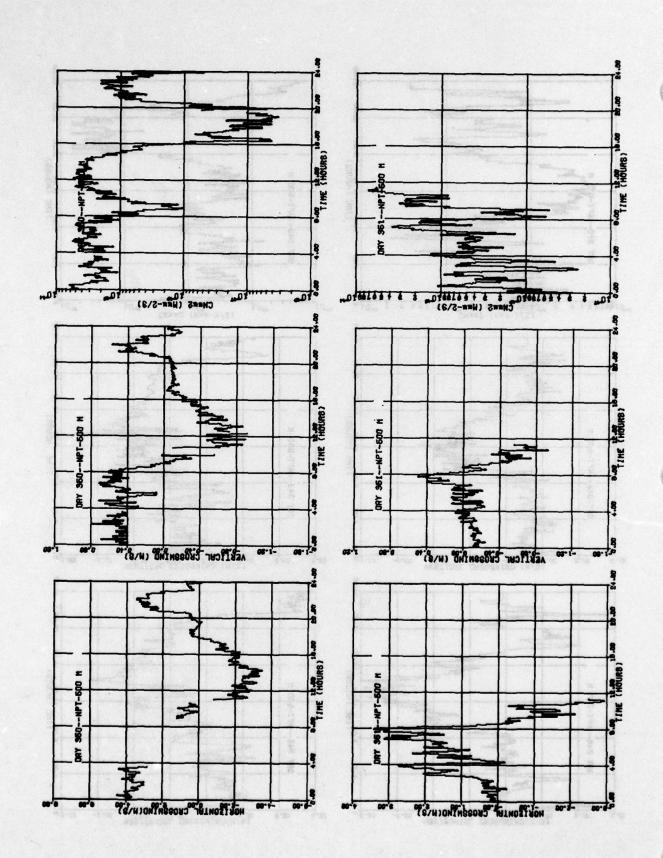












APPENDIX D

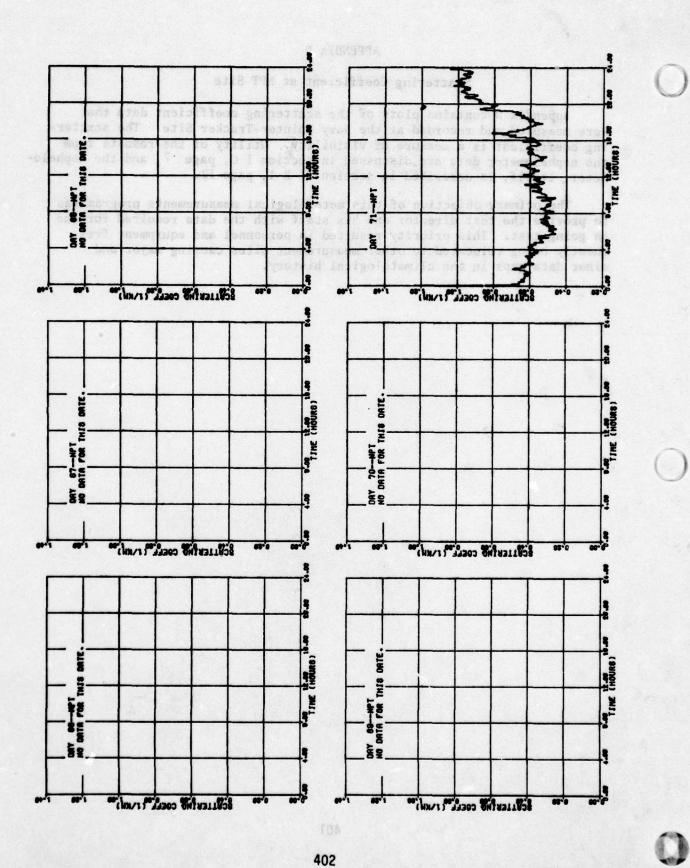
Scattering Coefficient at NPT Site

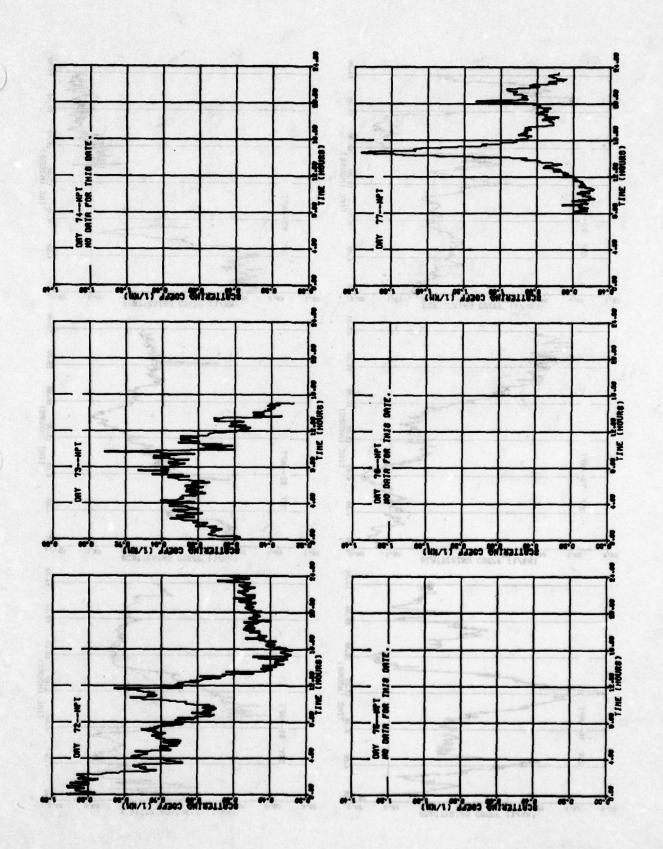
Appendix D contains plots of the scattering coefficient data that were measured and recorded at the Navy Pointer-Tracker Site. The scattering coefficient is a measure of visibility. Utility of the results from the nephelometer data are discussed in section I C, page 7, and the nephelometer, itself, is described in section II B 1, page 12.

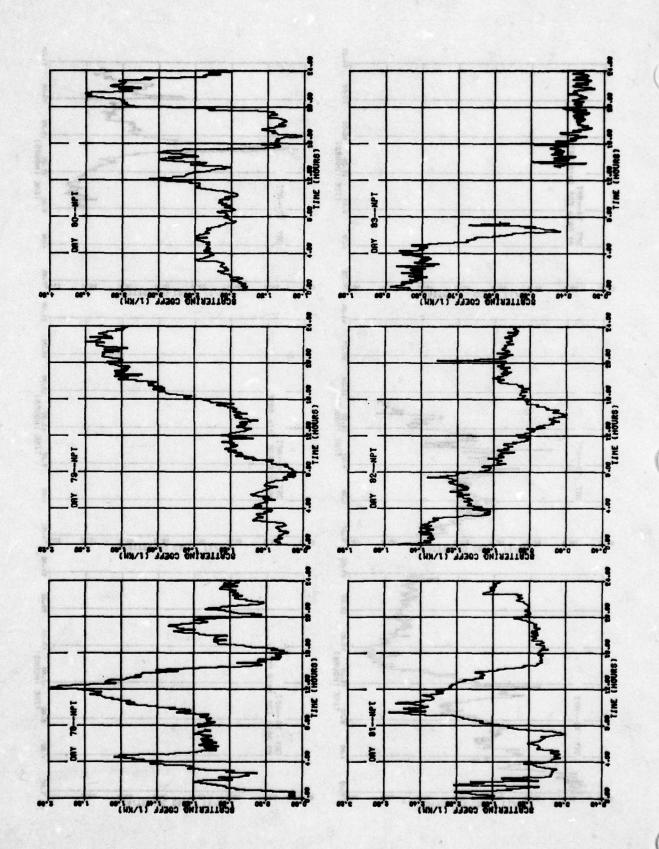
The primary objective of this meterological measurements program was to provide the test director and his staff with the data required for the on going test. This priority resulted in personnel and equipment frequently being relocated to other measurement sites causing major and minor data gaps in the climatological history.

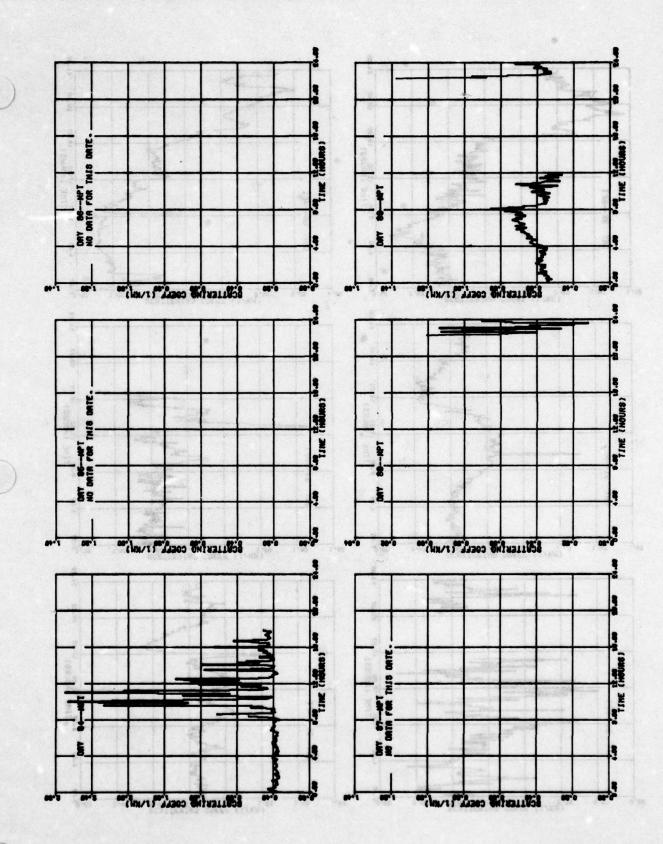
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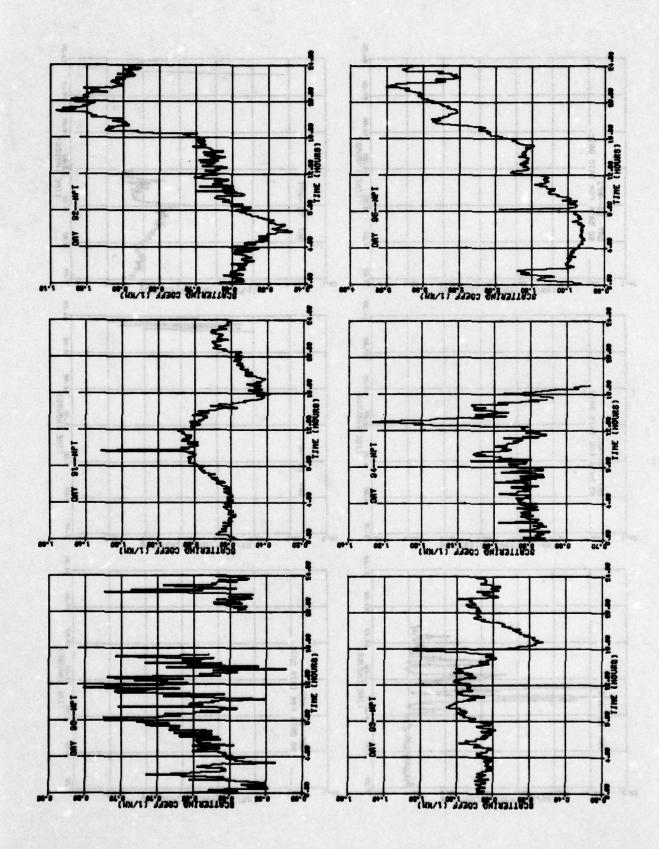
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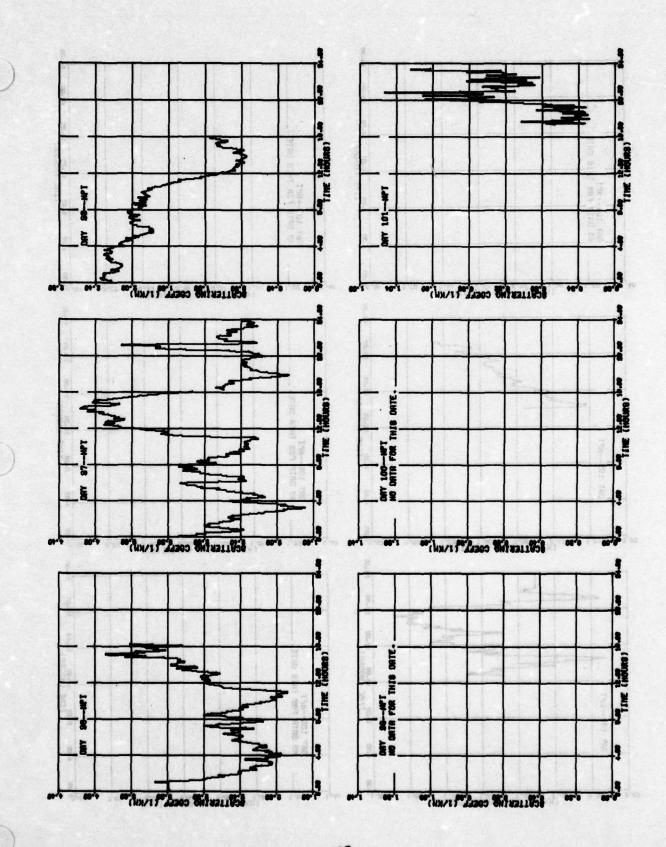


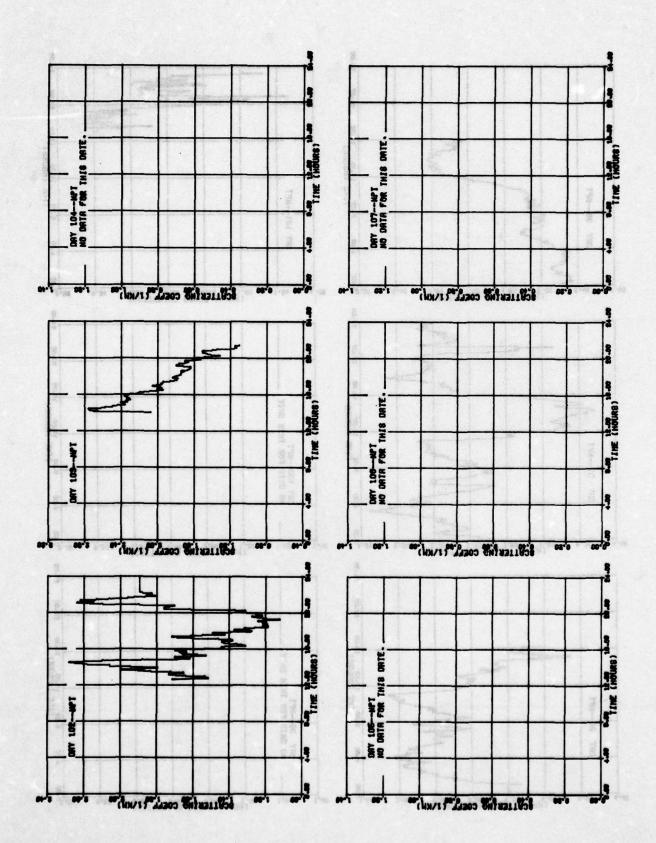


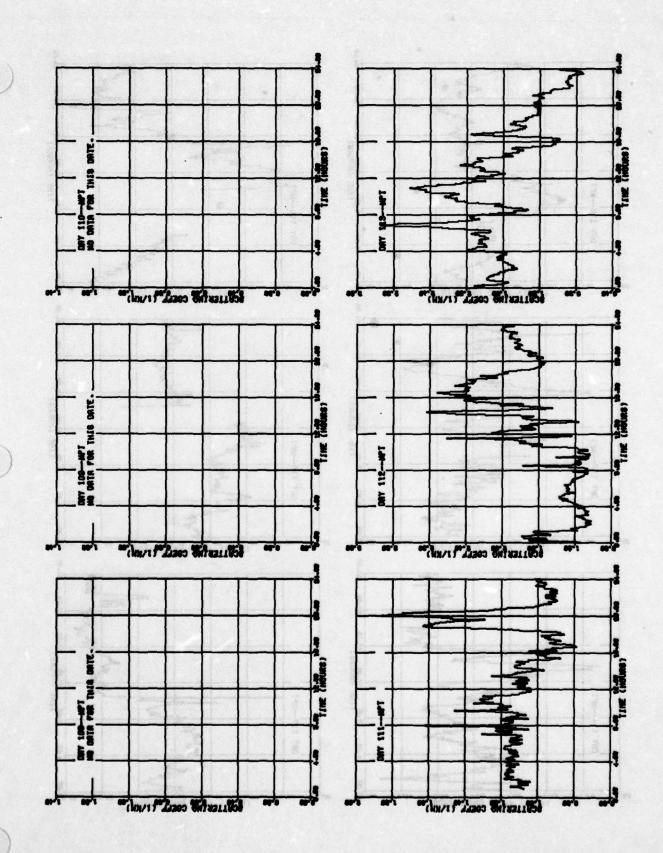


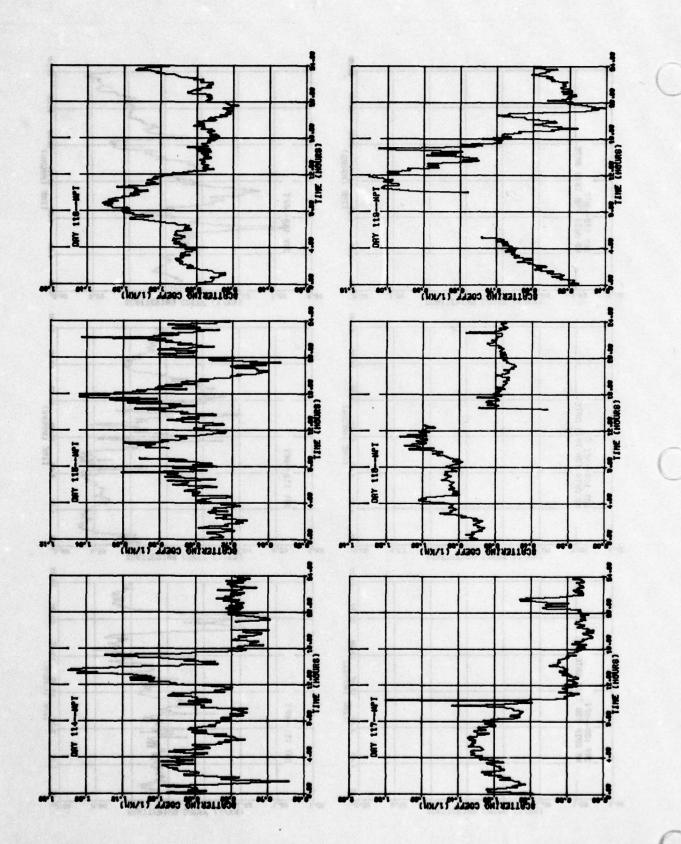


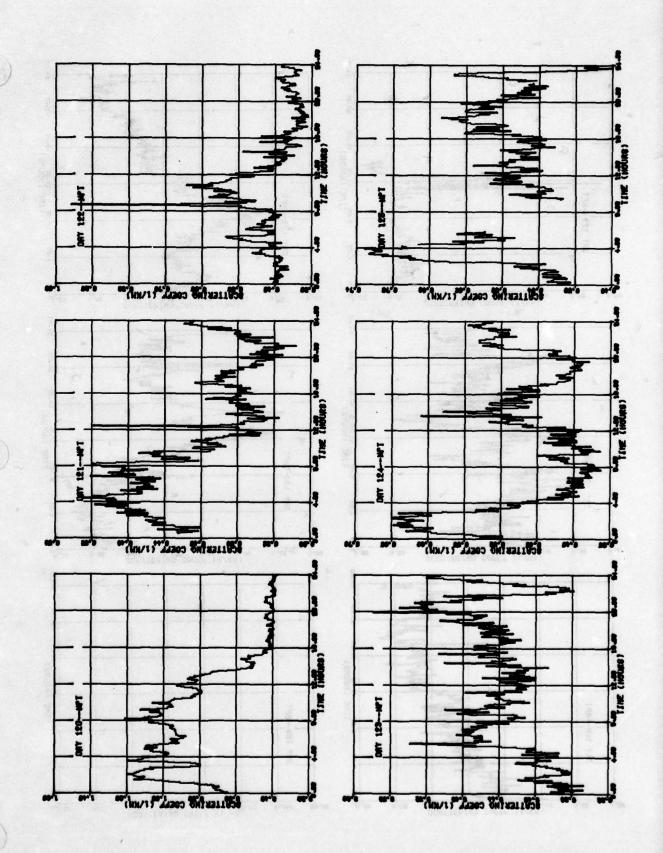


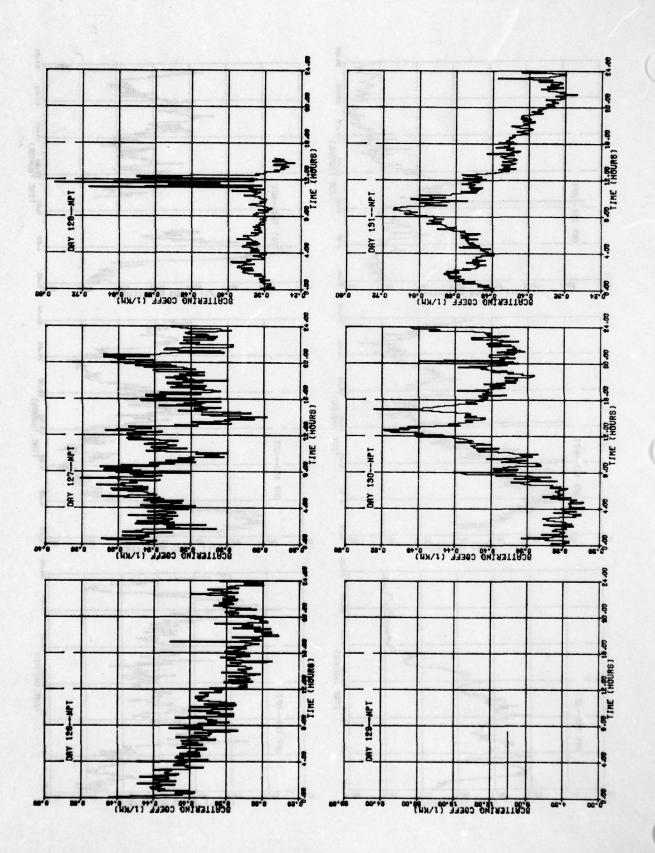


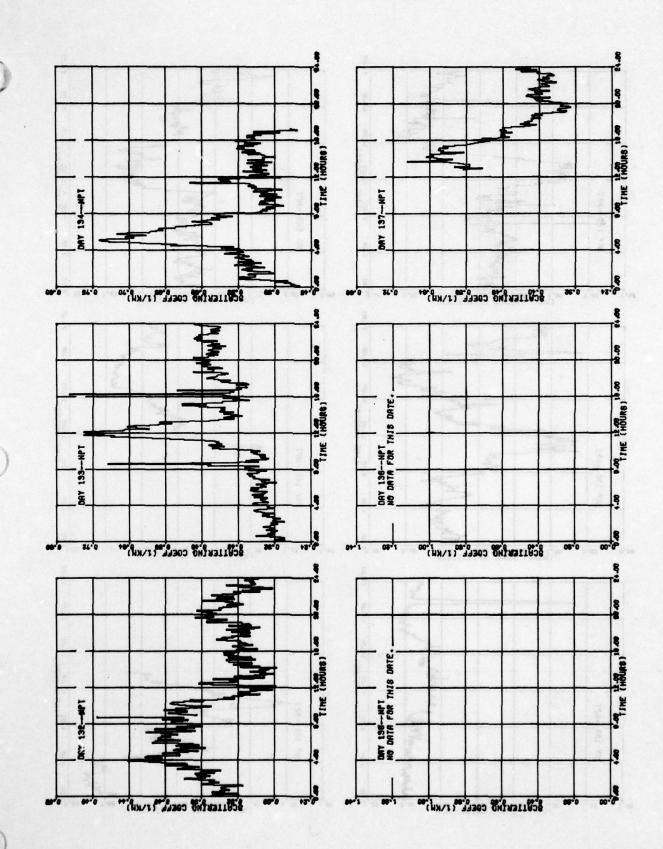


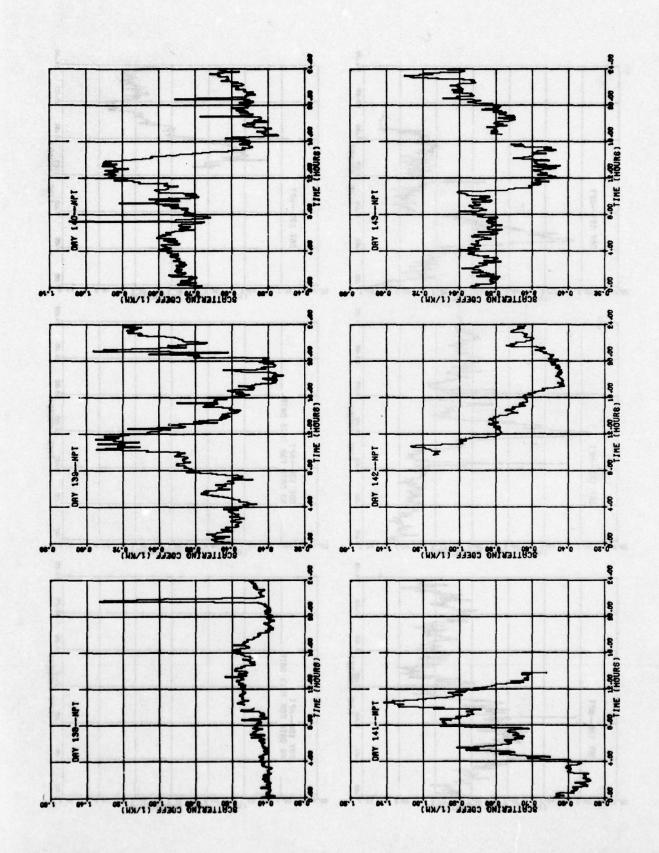


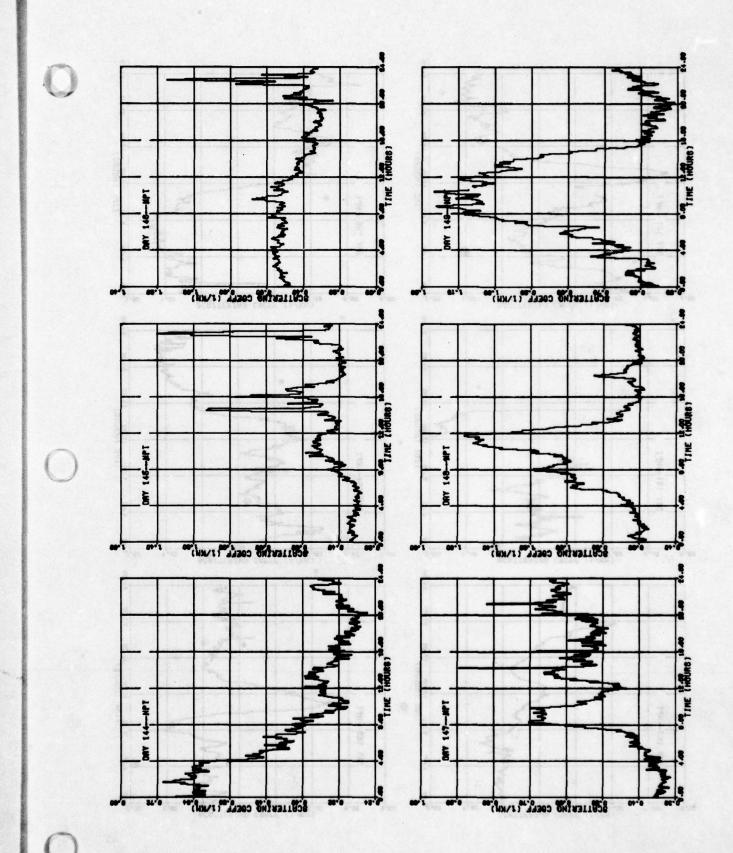


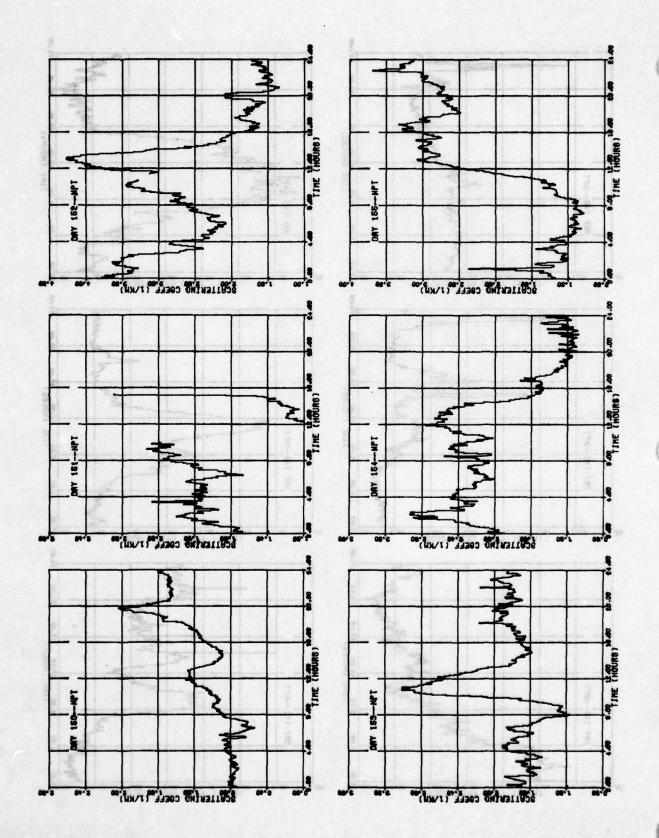


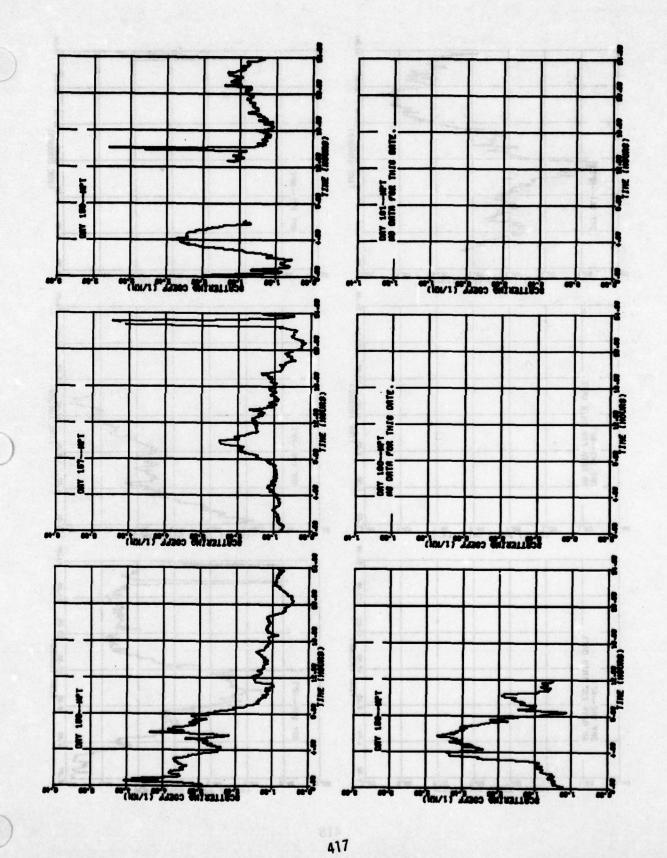


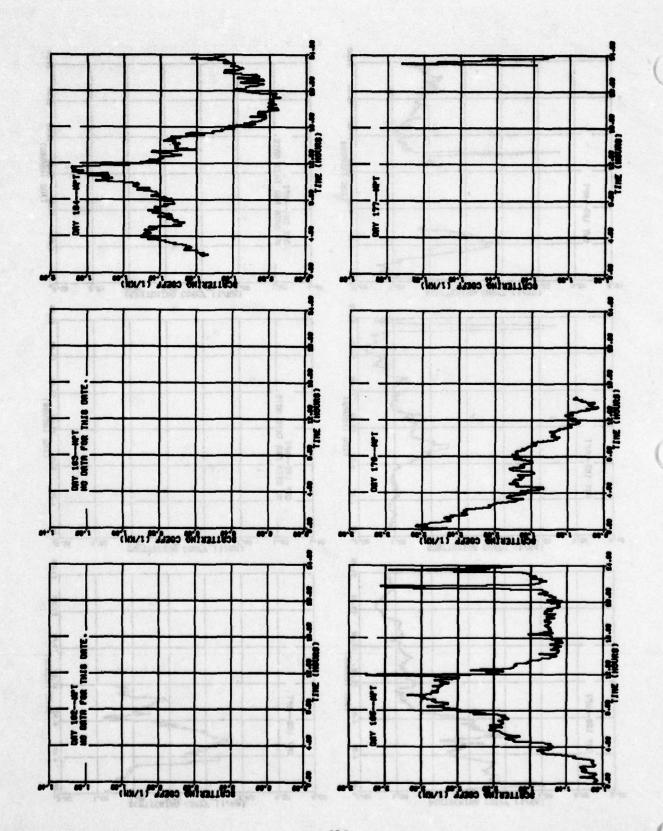


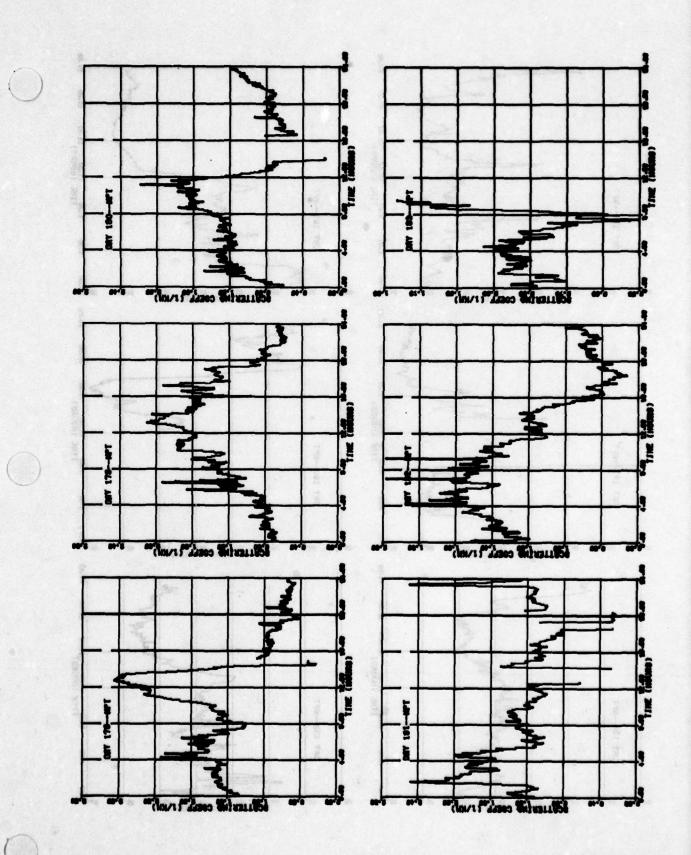


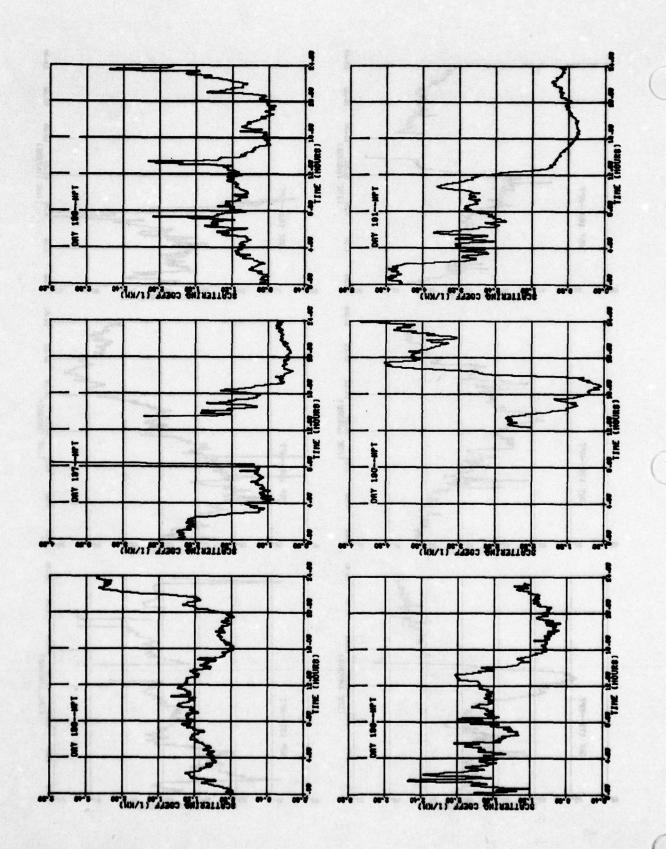


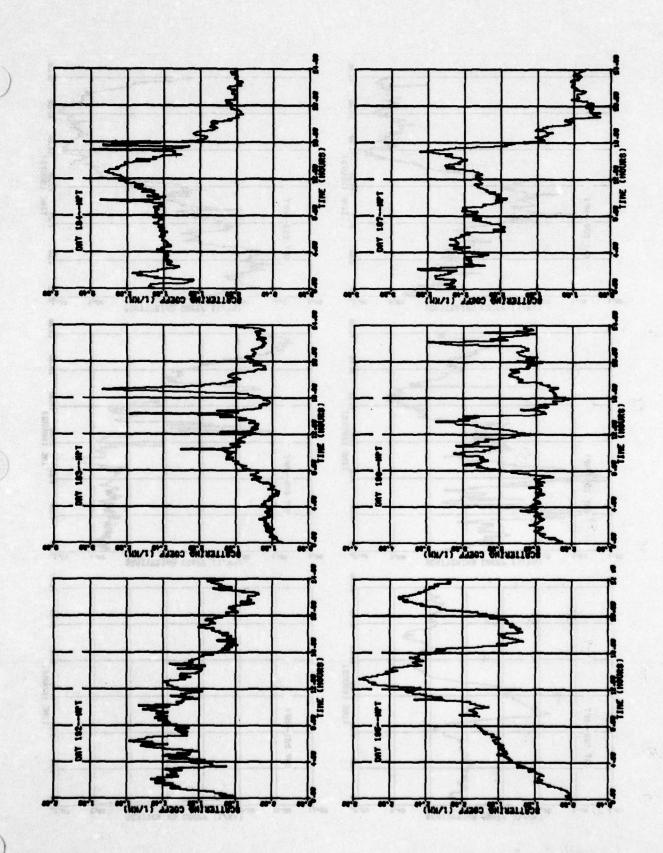


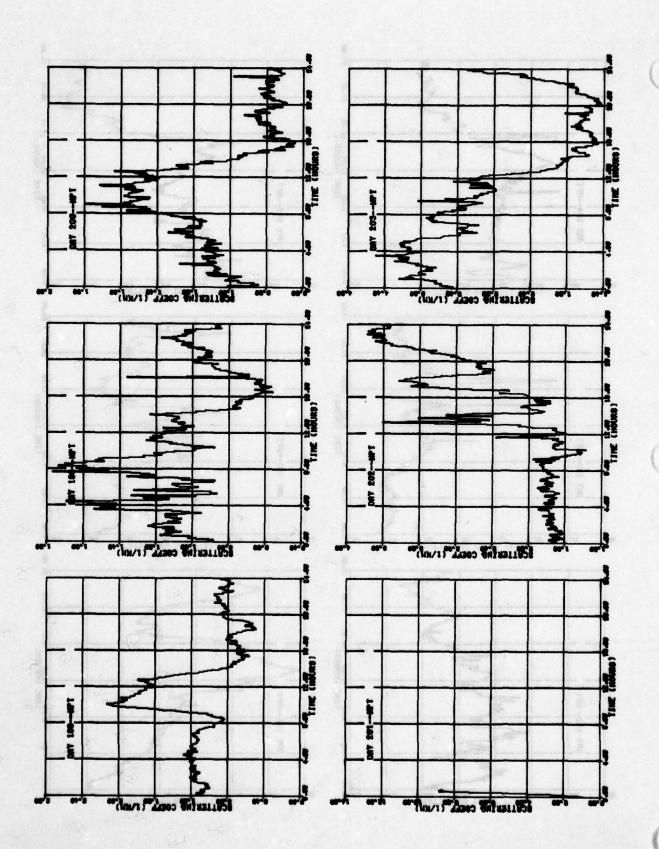


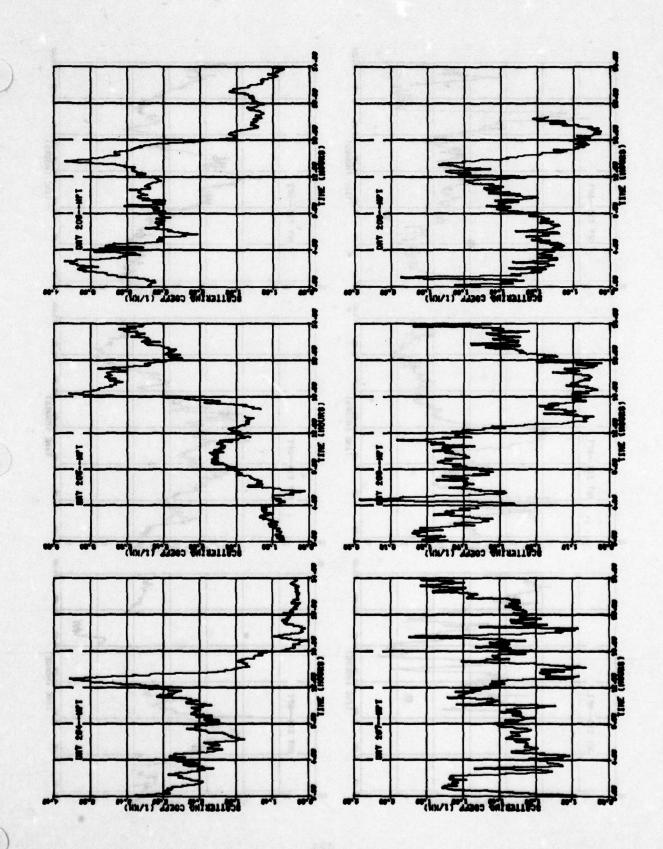


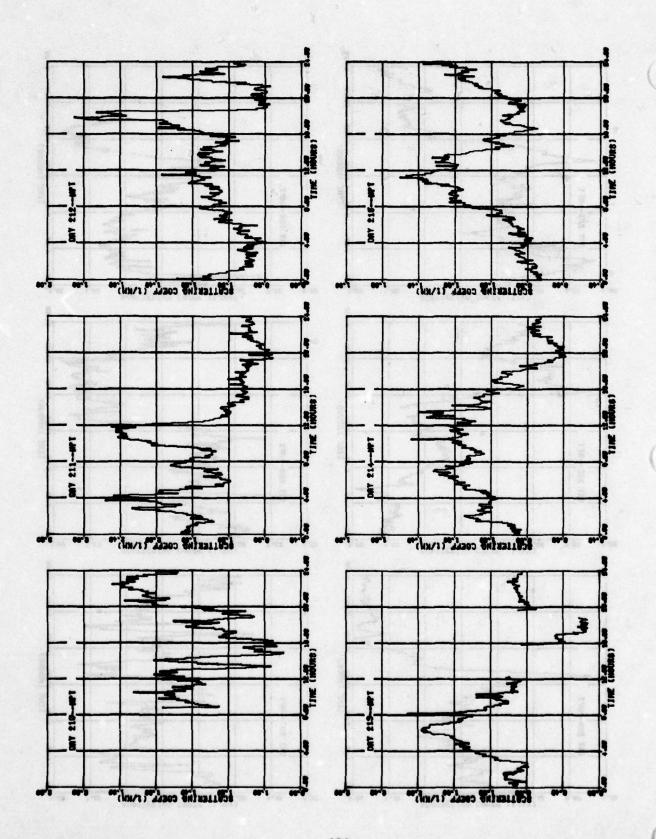


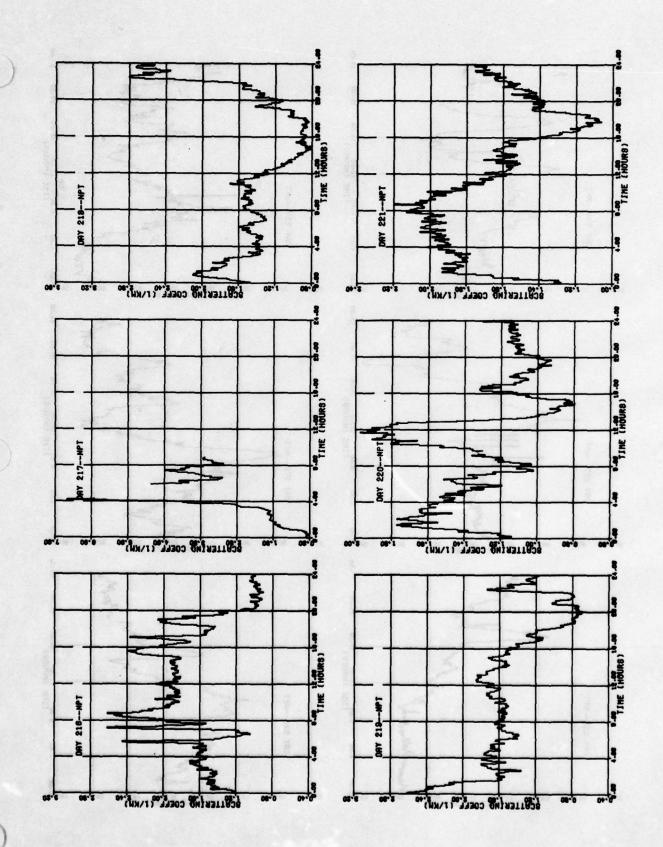


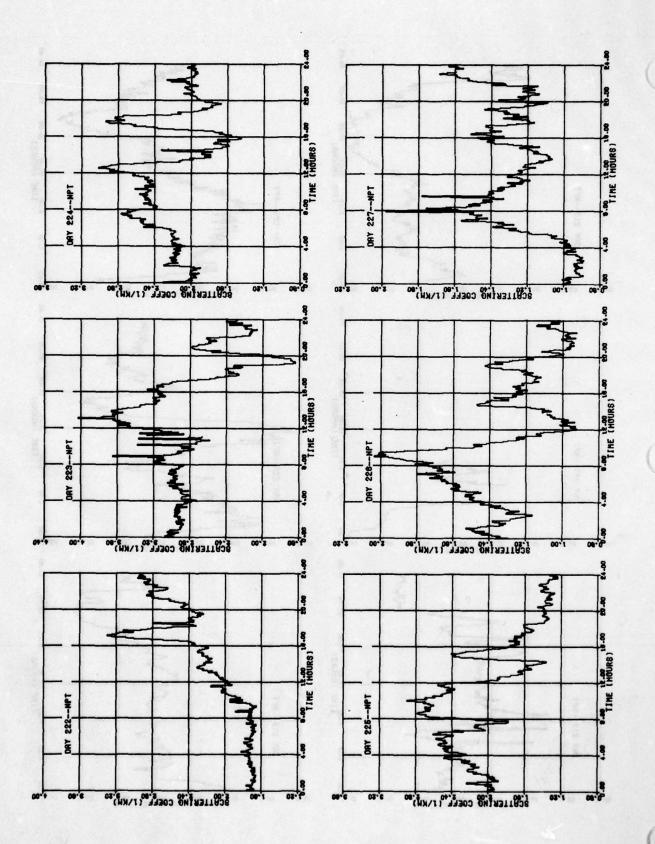


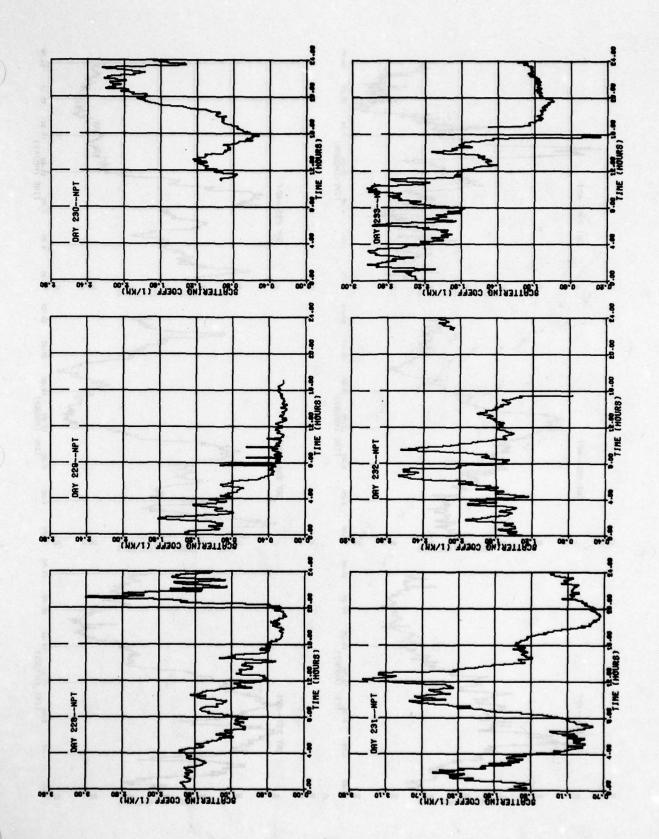


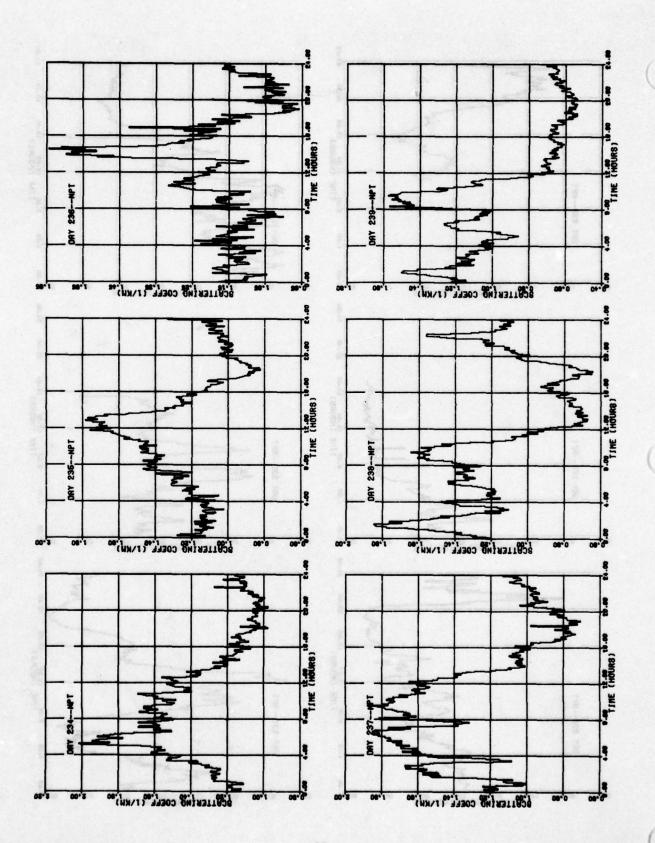


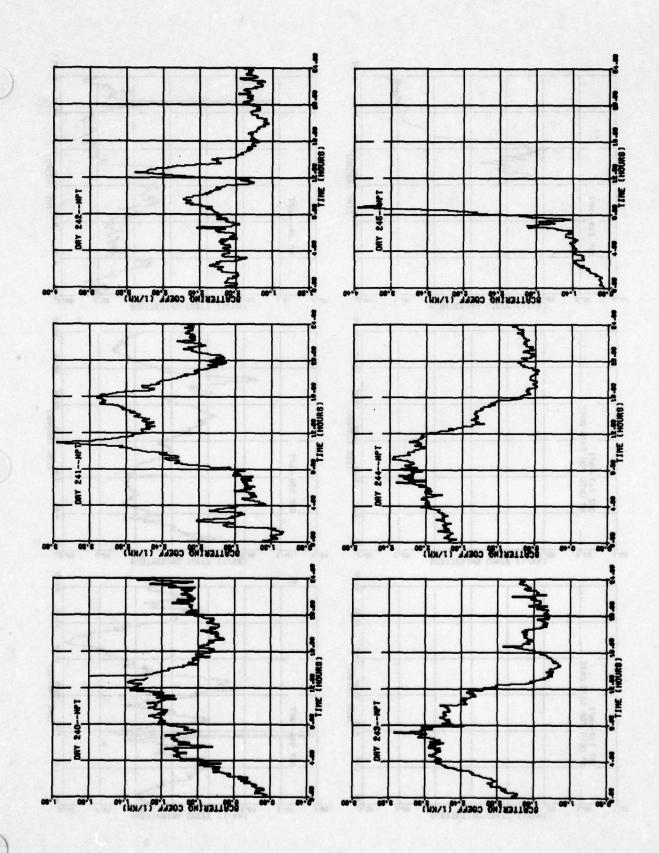


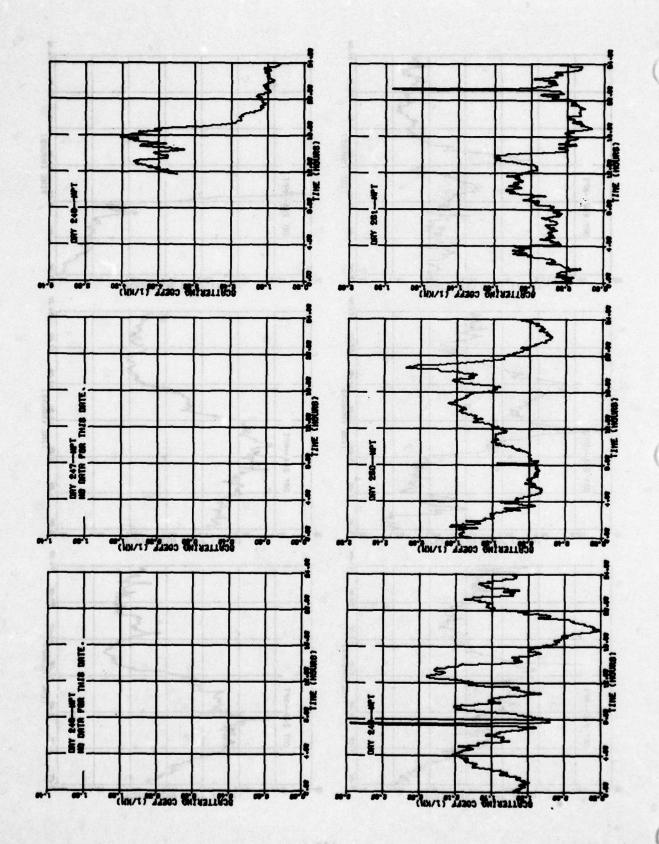


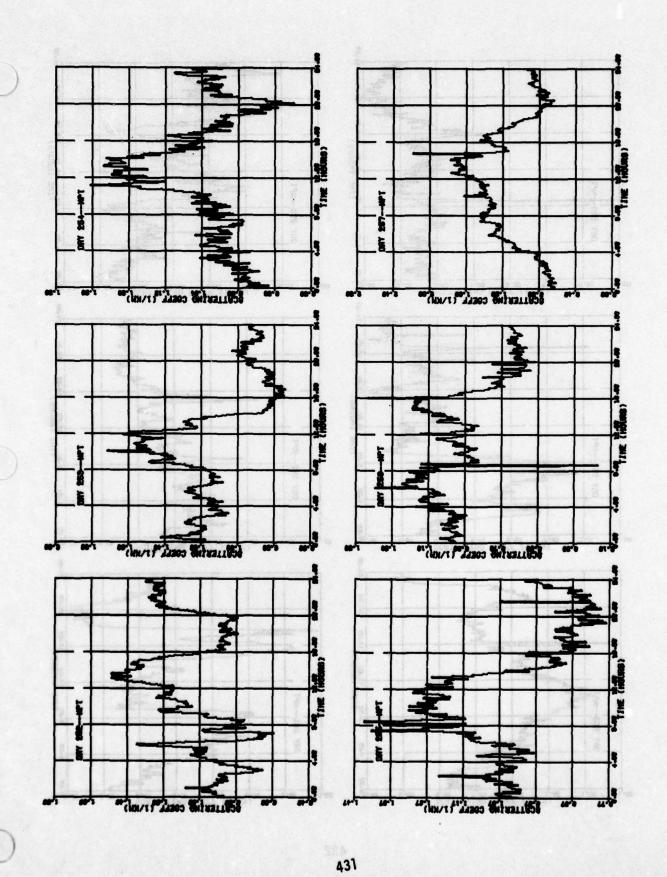


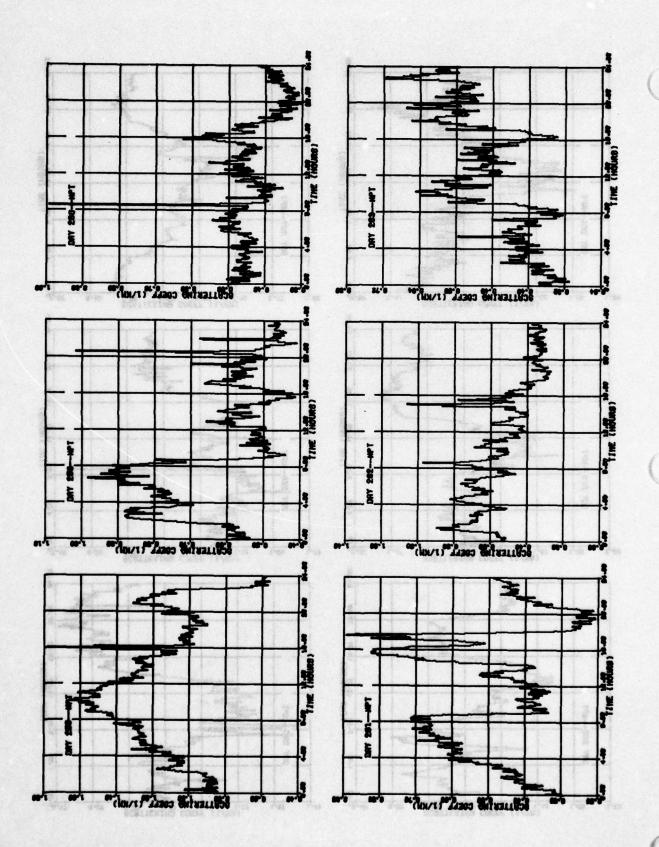


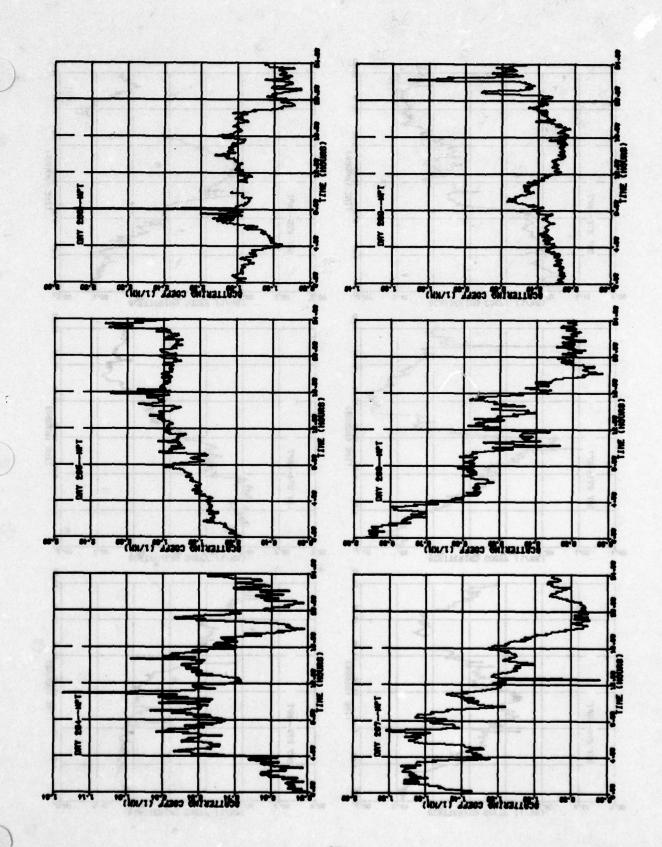


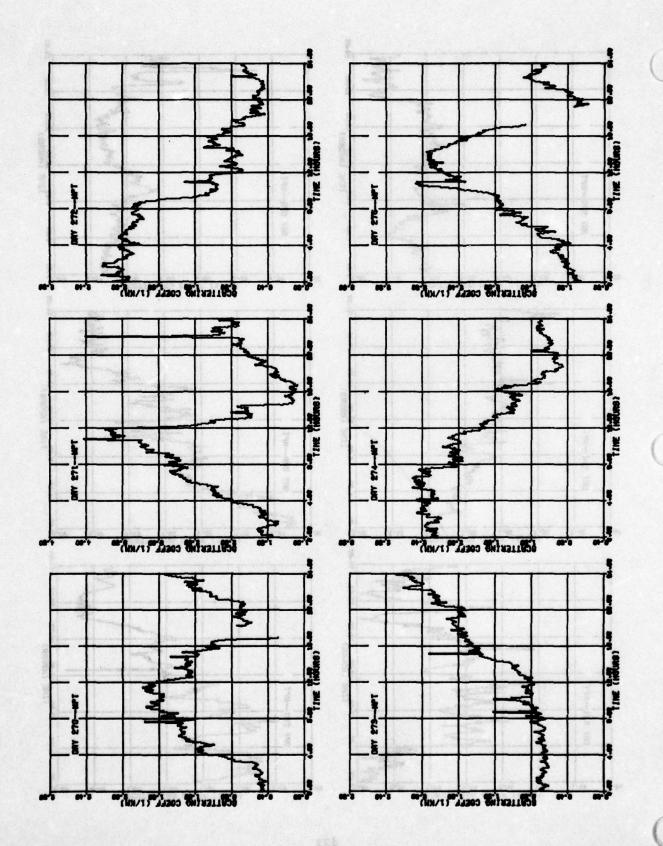


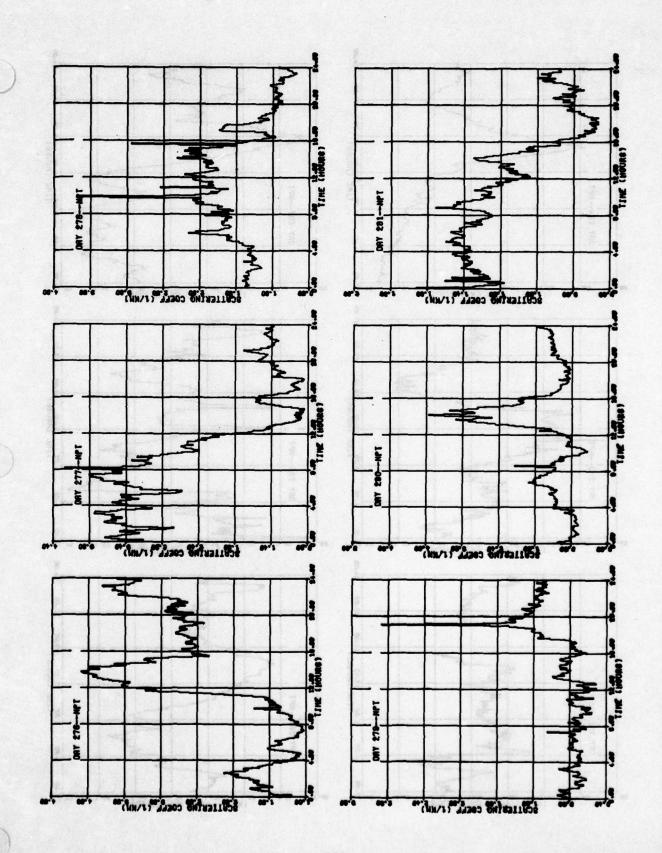


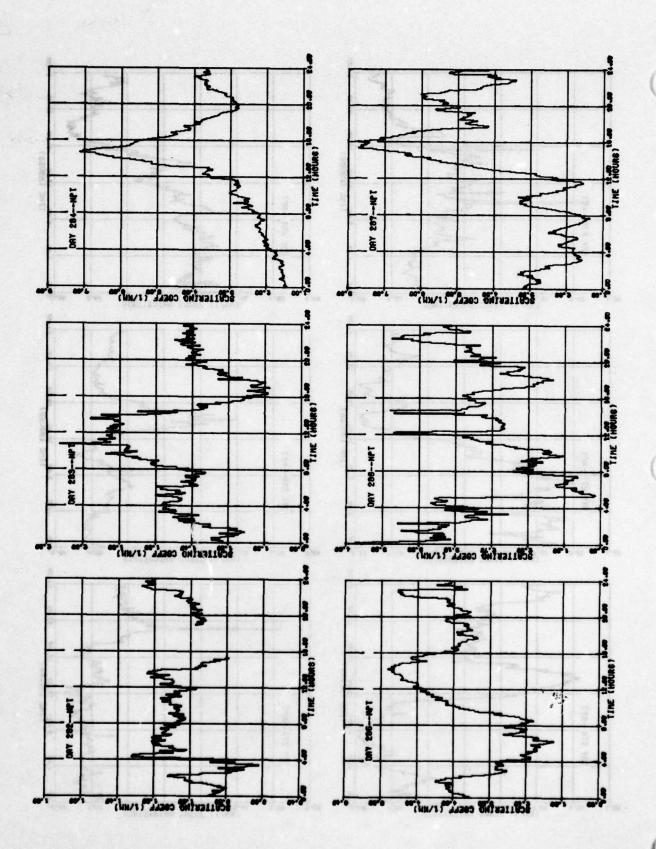


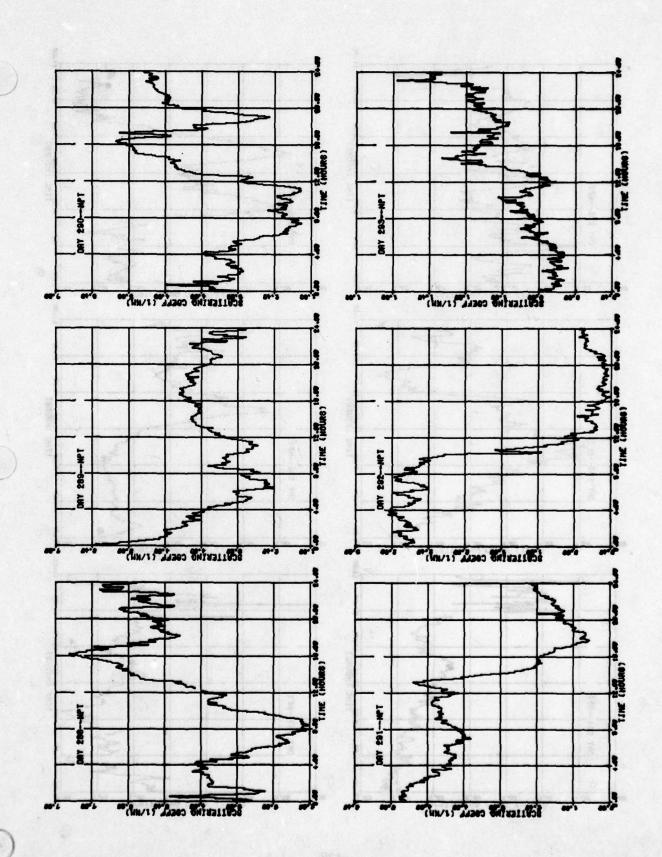


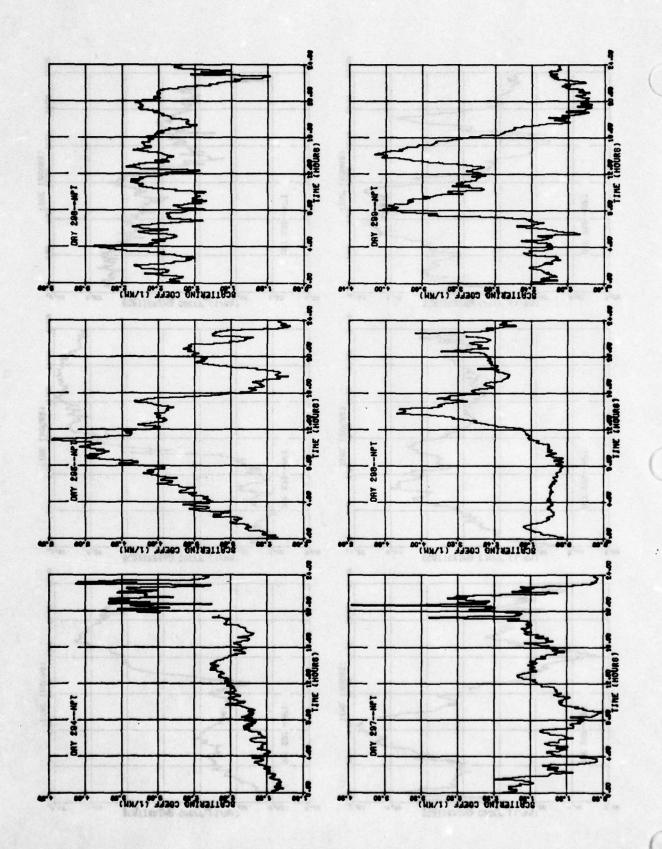


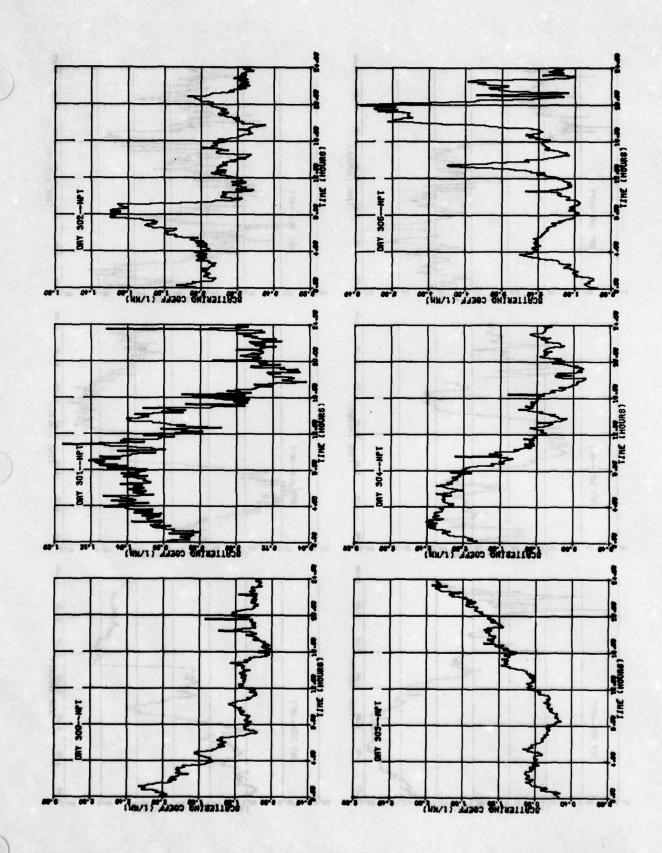


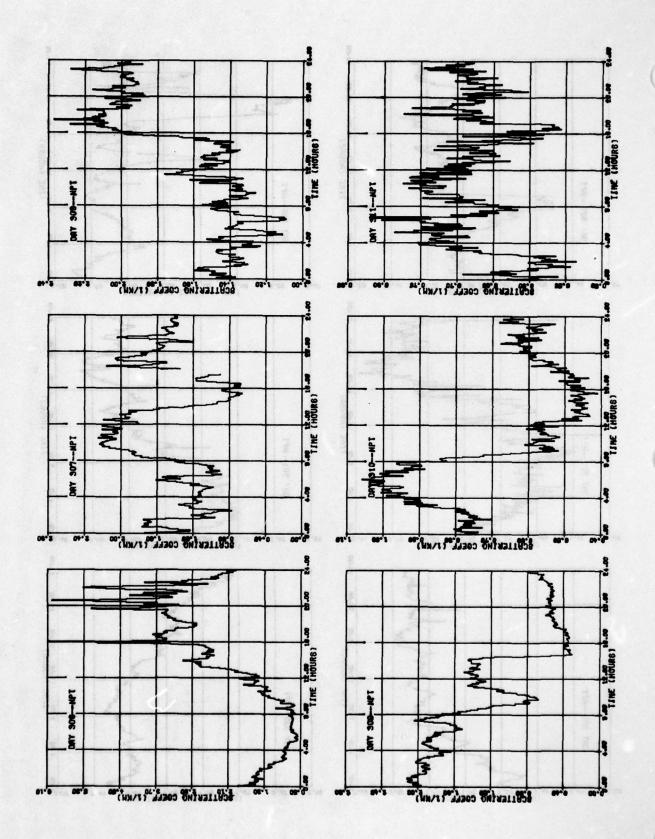


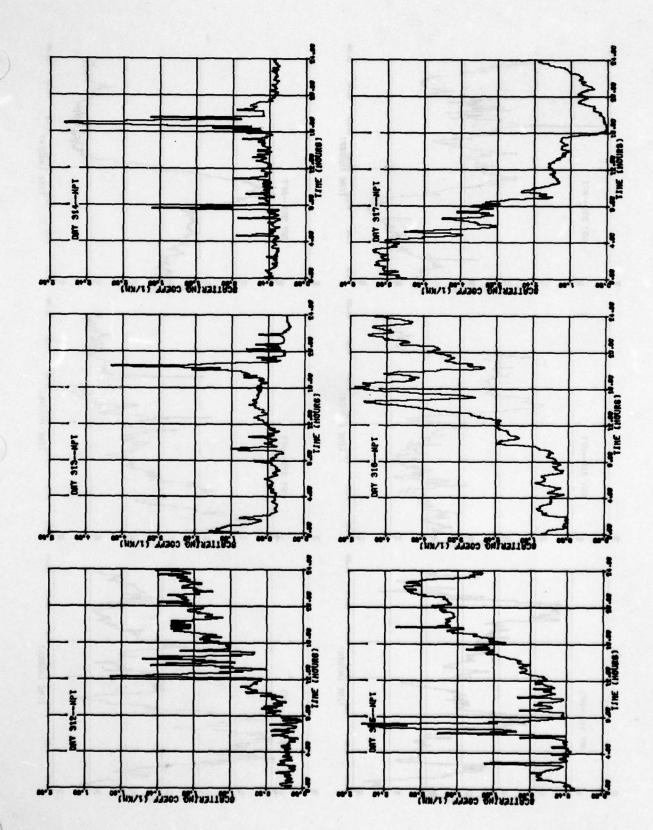


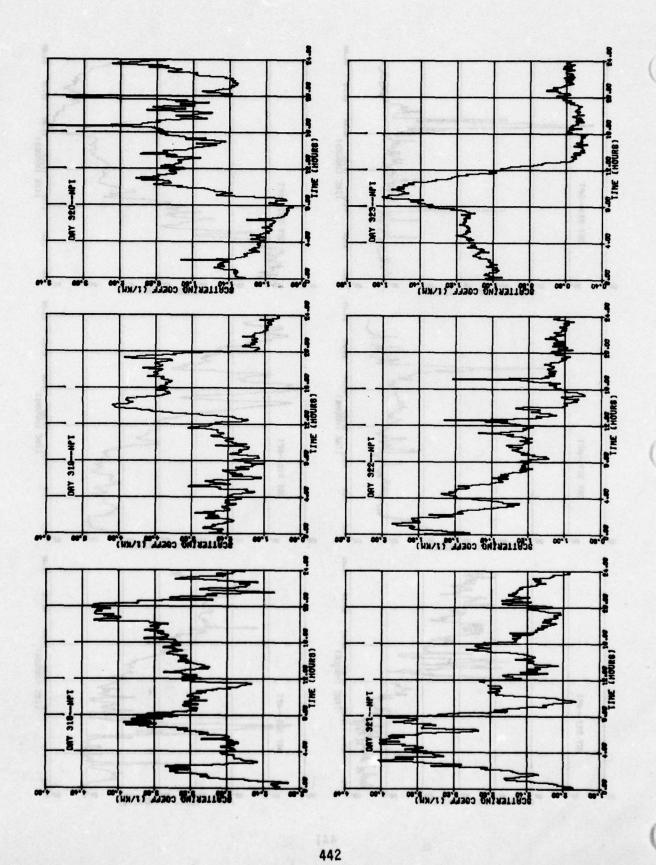


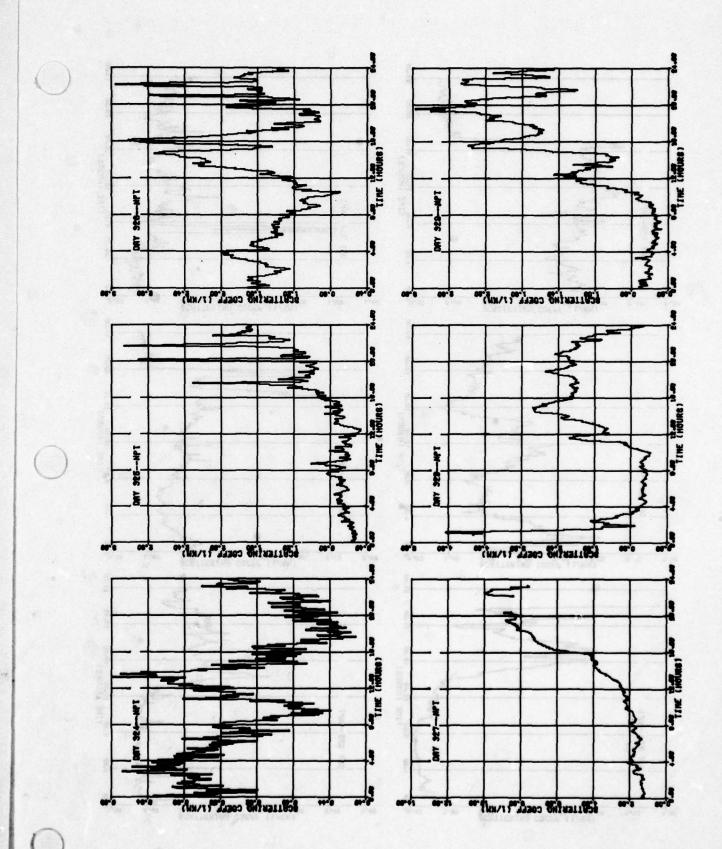


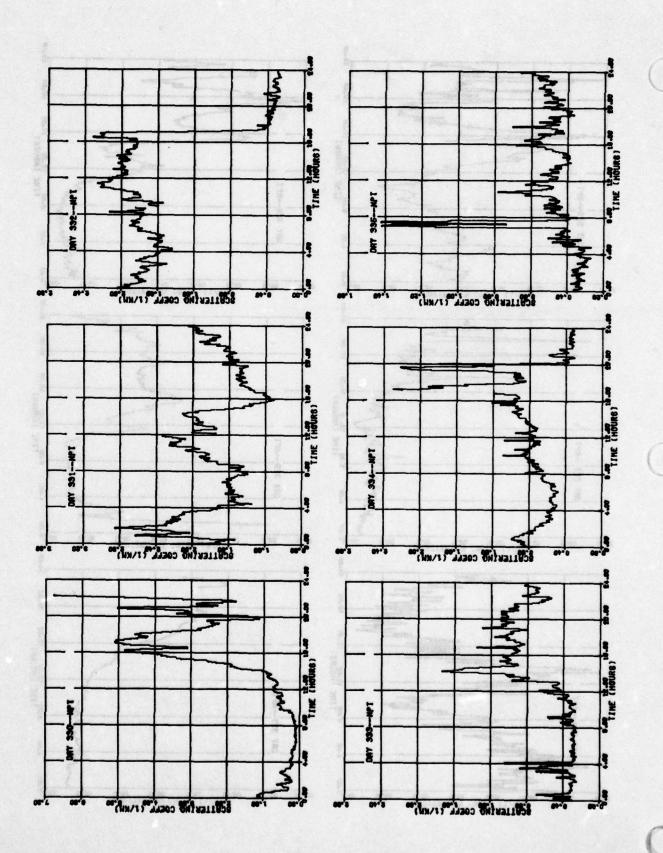


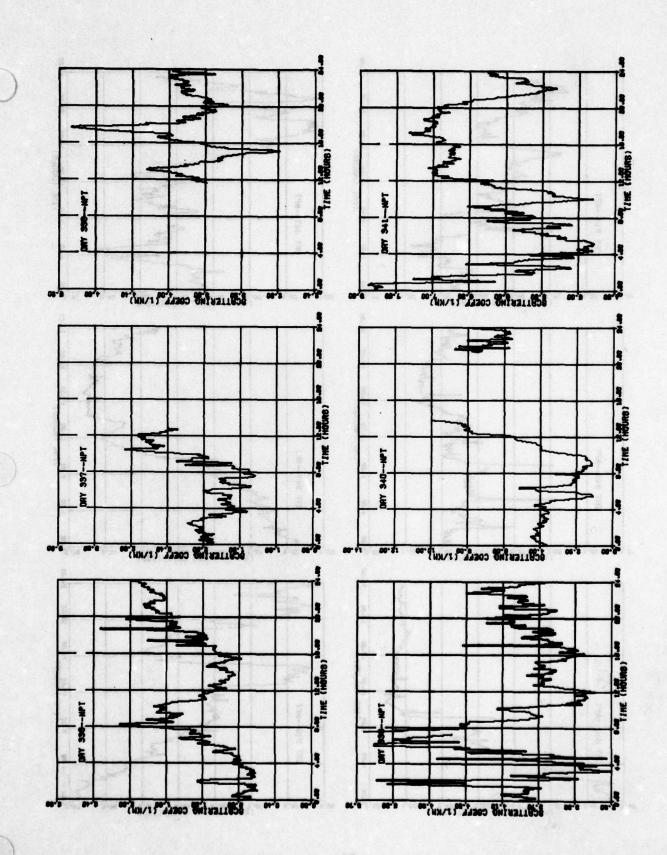


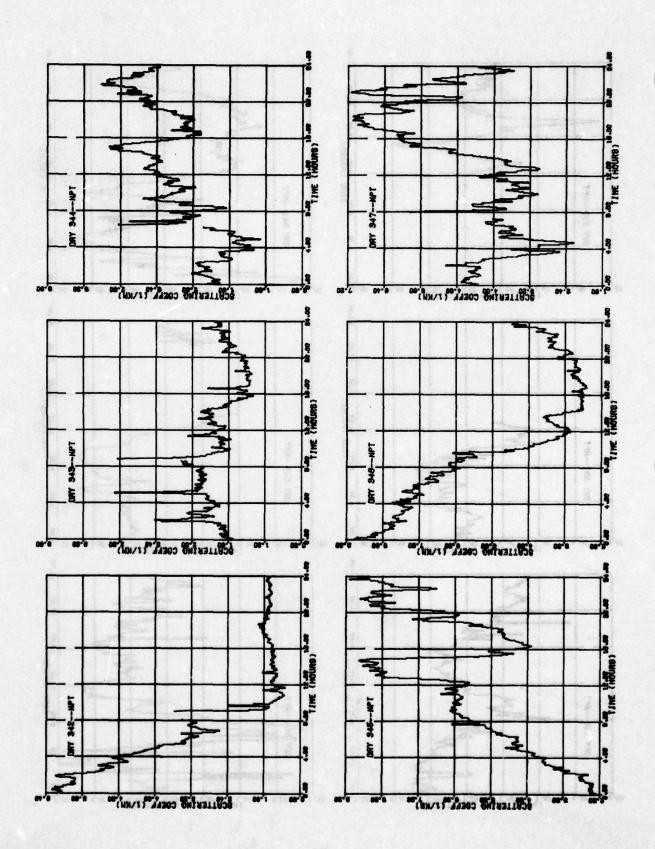


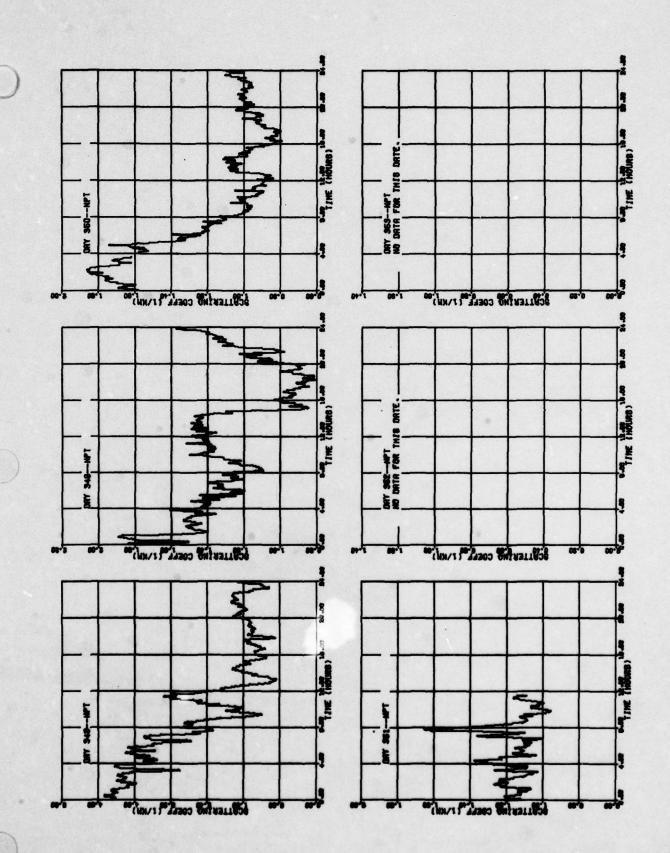










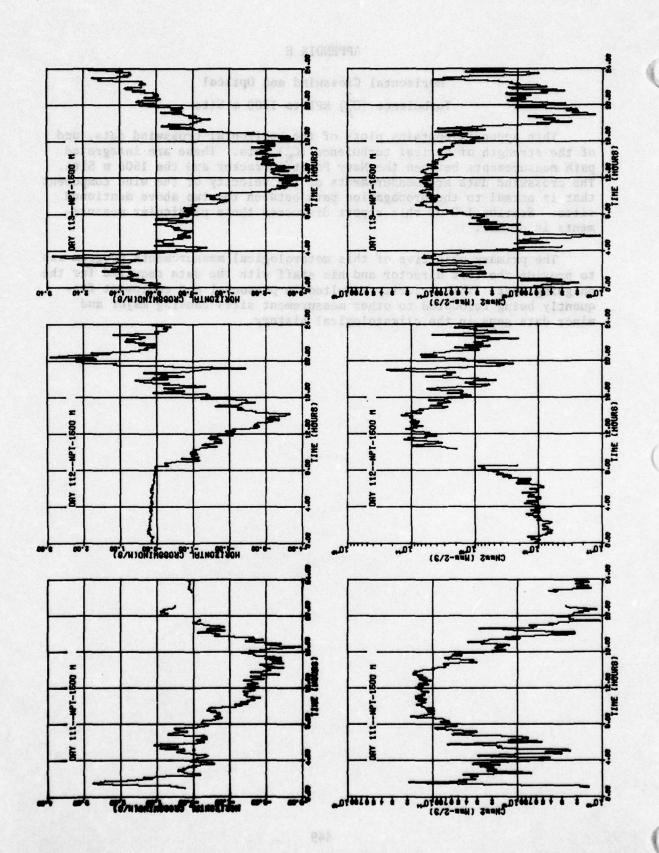


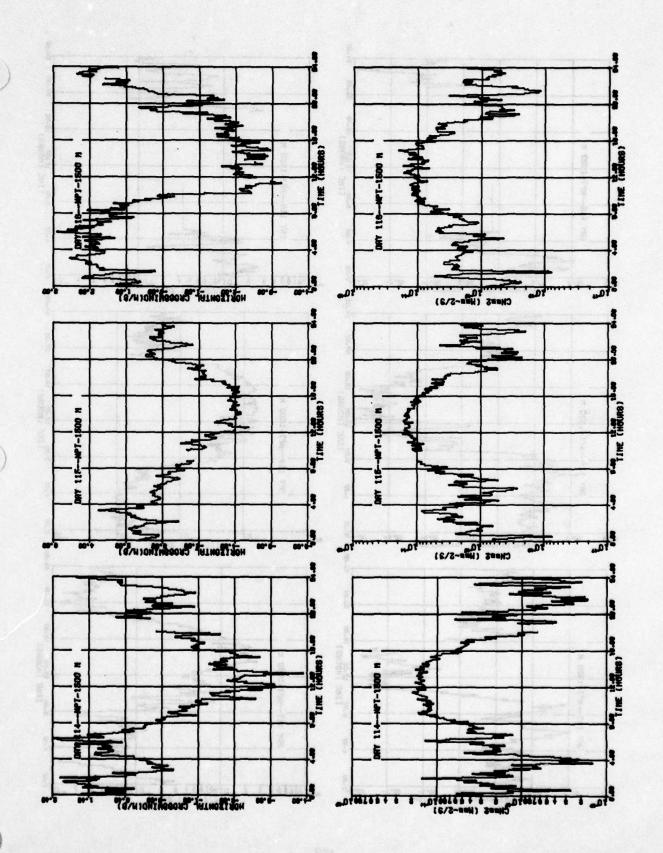
APPENDIX E

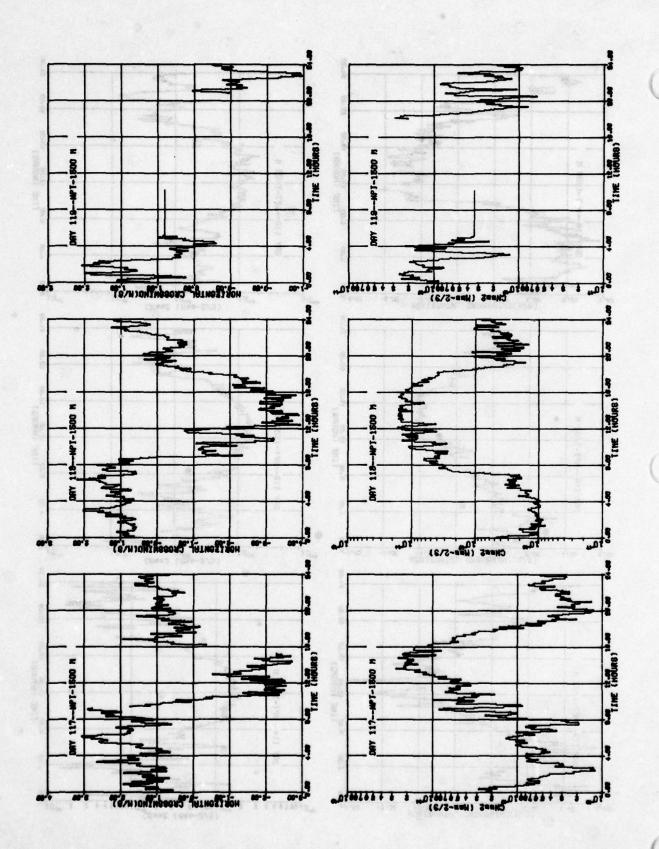
Horizontal Crosswind and Optical Turbulence (C_N^2) NPT to 1500 m Site

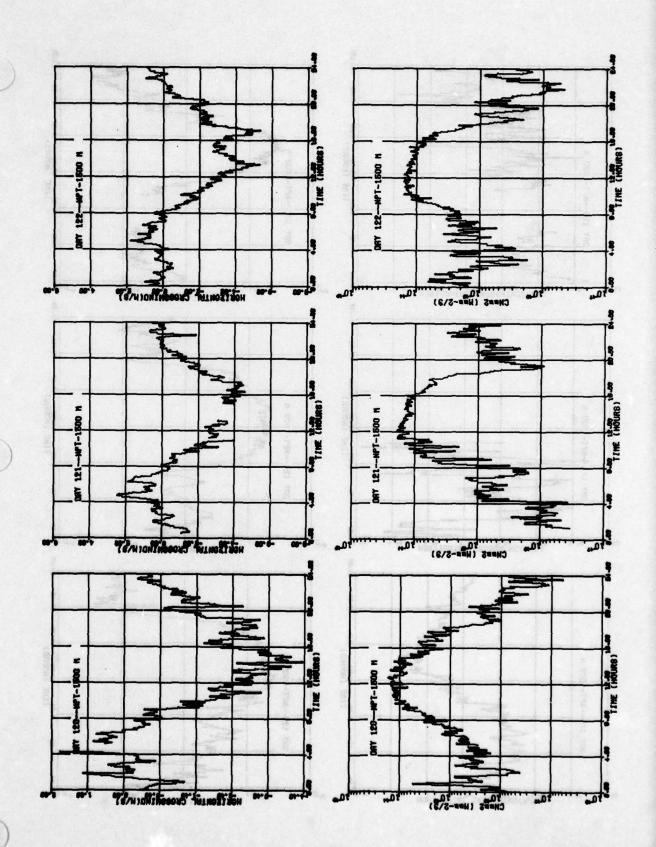
This appendix contains plots of the horizontal crosswind data, and of the strength of optical turbulence (C_N^2) data. These are integrated path measurements between the Navy Pointer-Tracker and the 1500 m Site. The crosswind data are measurements of the velocity of the wind component that is normal to the propagation path between the two above mentioned sites. Section I C of this report discusses these particular measurements in detail.

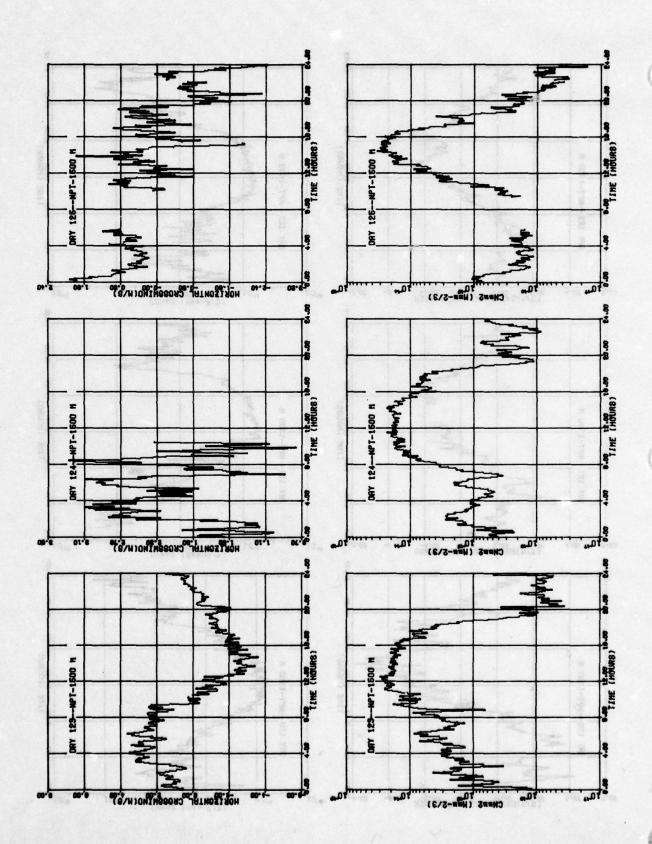
The primary objective of this meterological measurements program was to provide the test director and his staff with the data required for the on going test. This priority resulted in personnel and equipment frequently being relocated to other measurement sites causing major and minor data gaps in the climatological history.

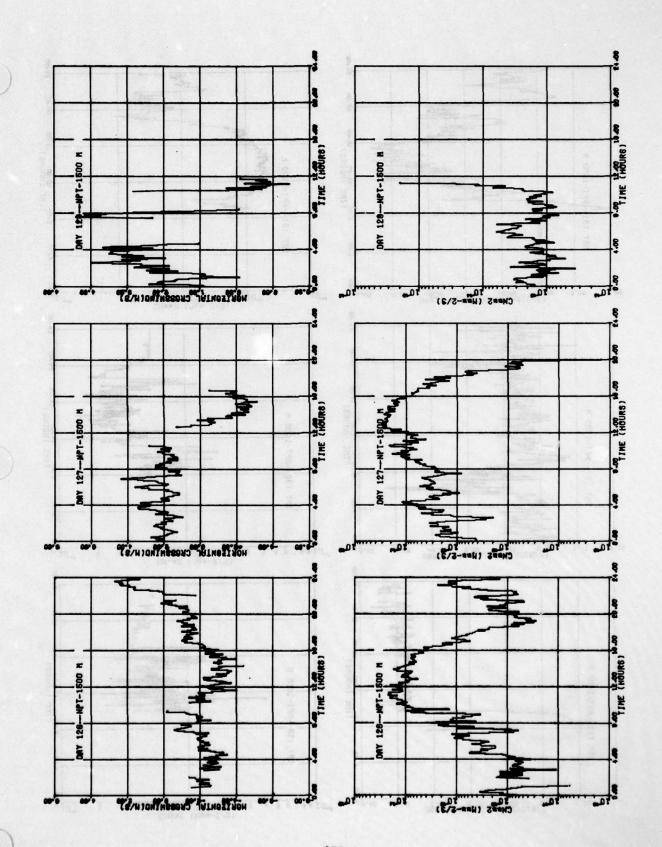


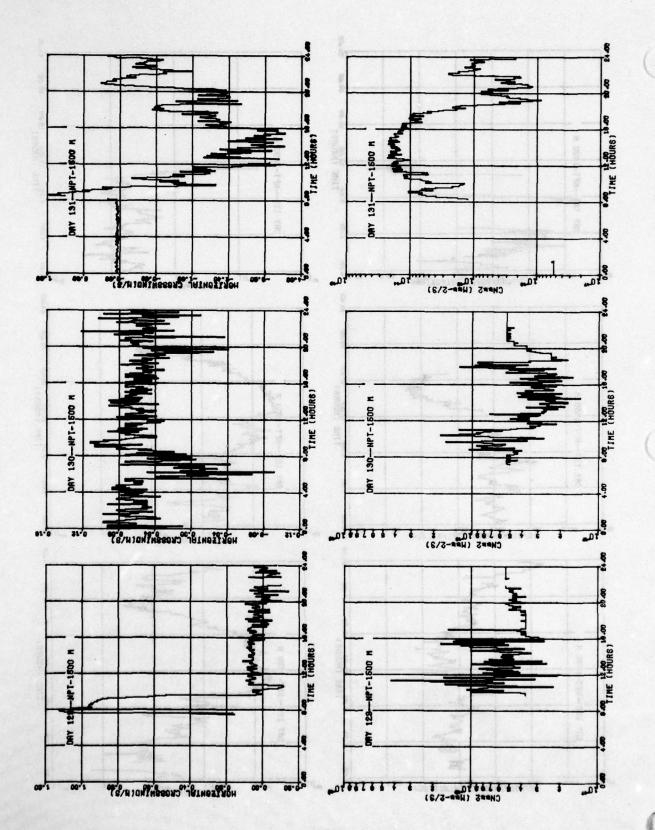


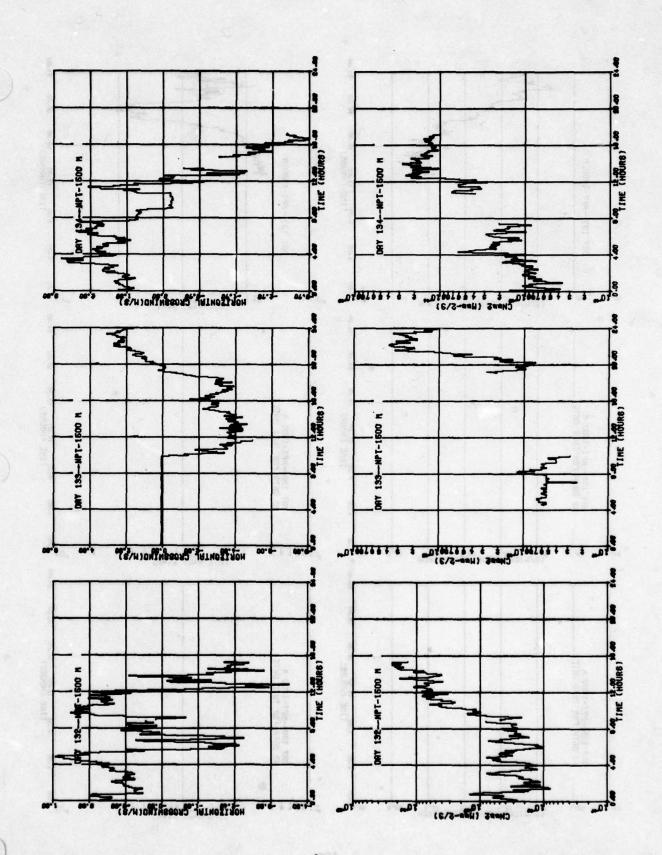


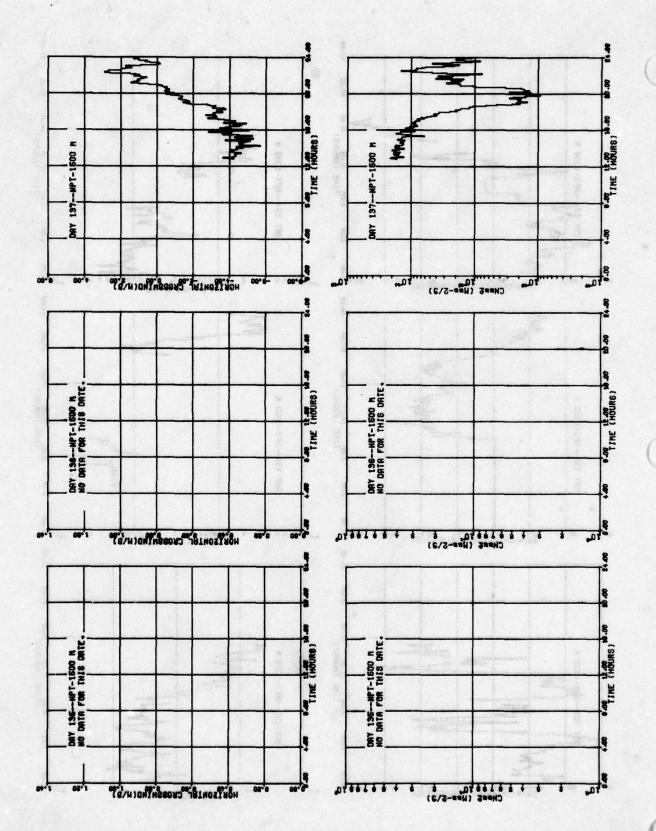


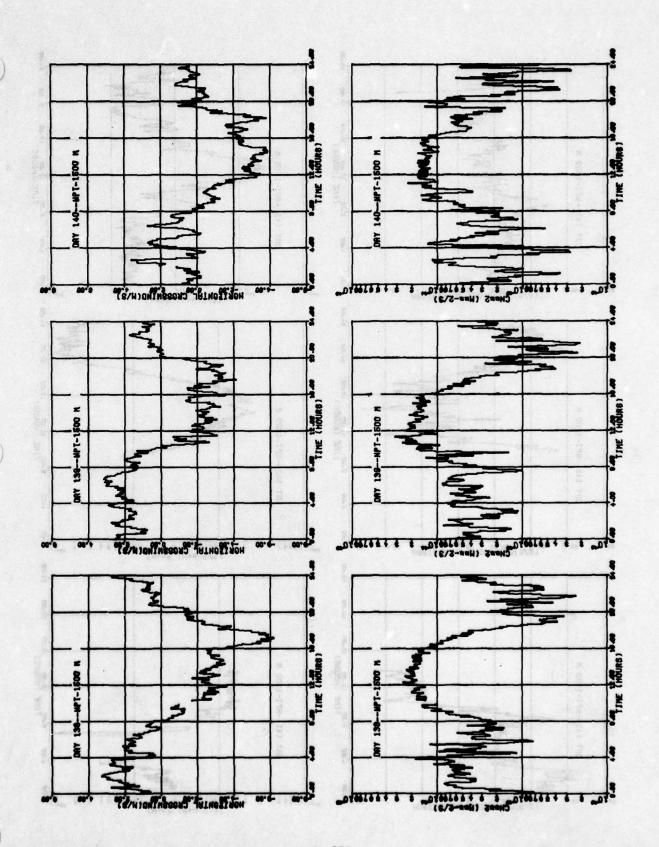


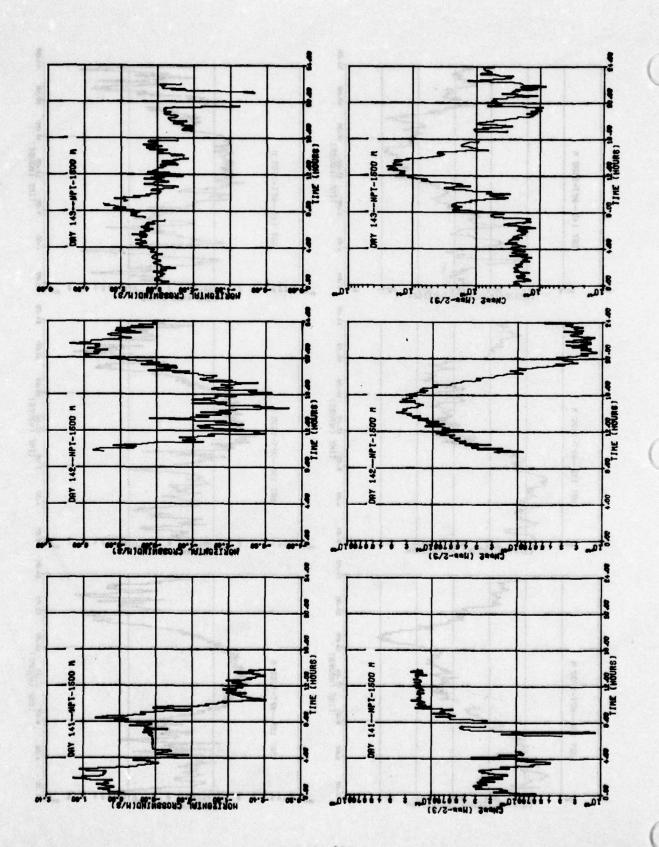


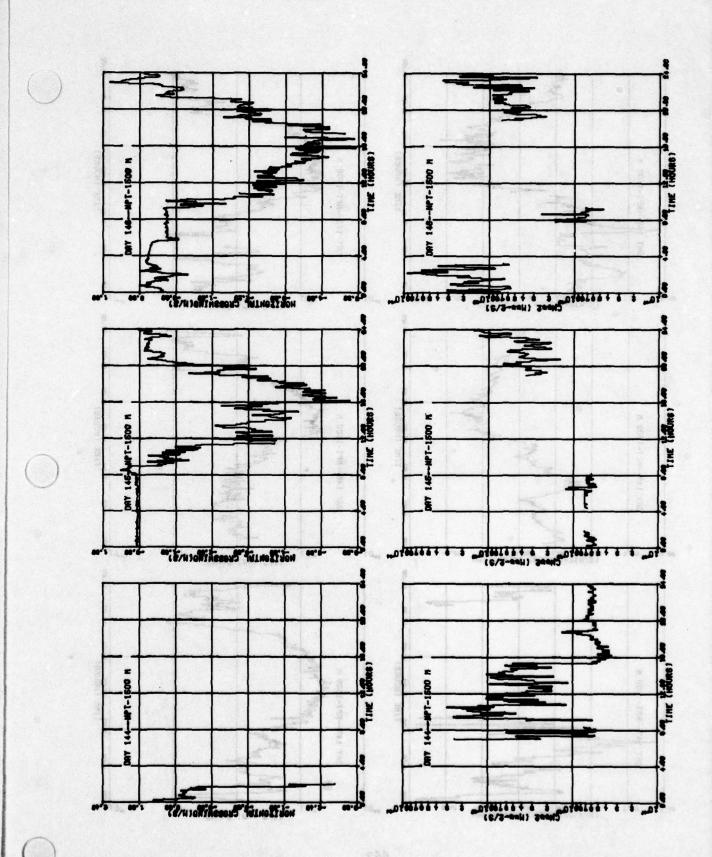


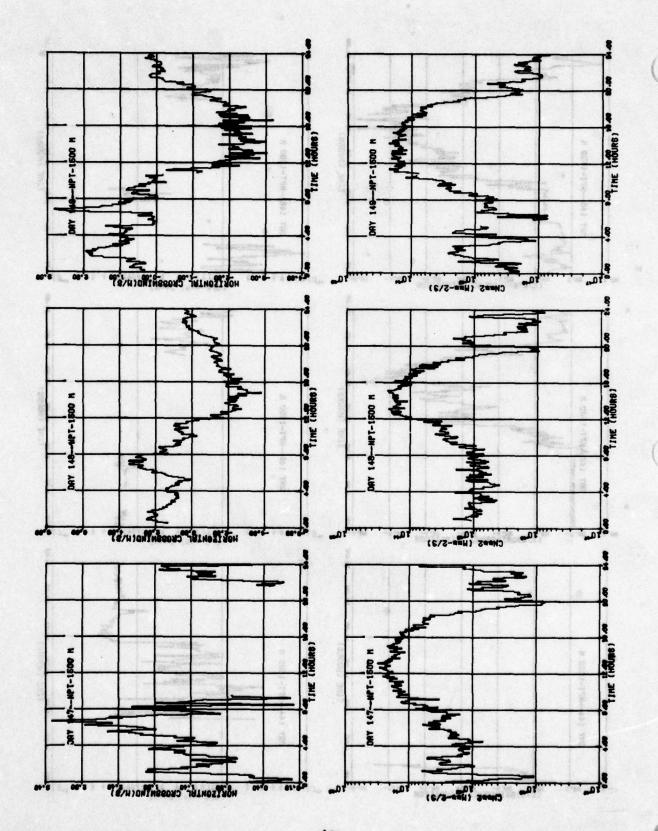


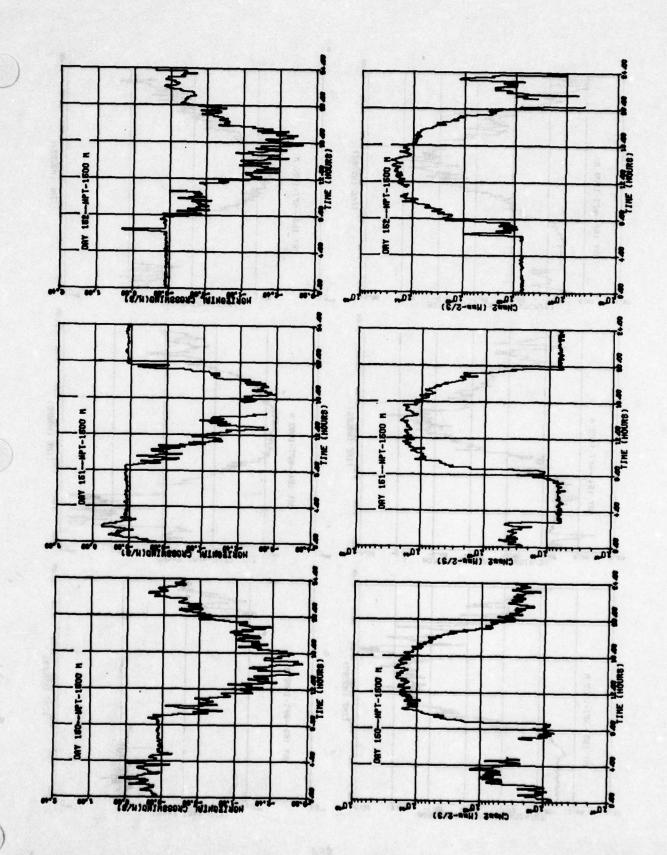


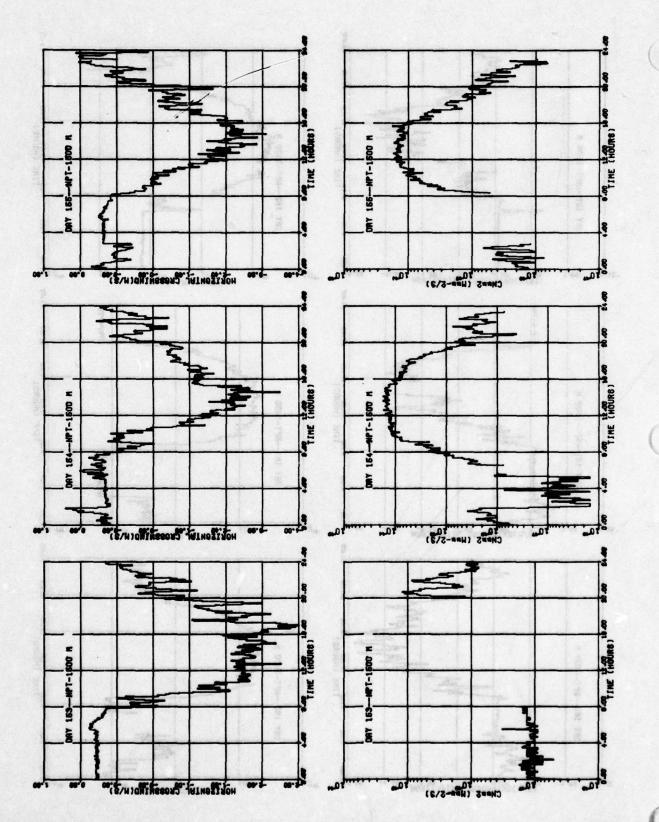


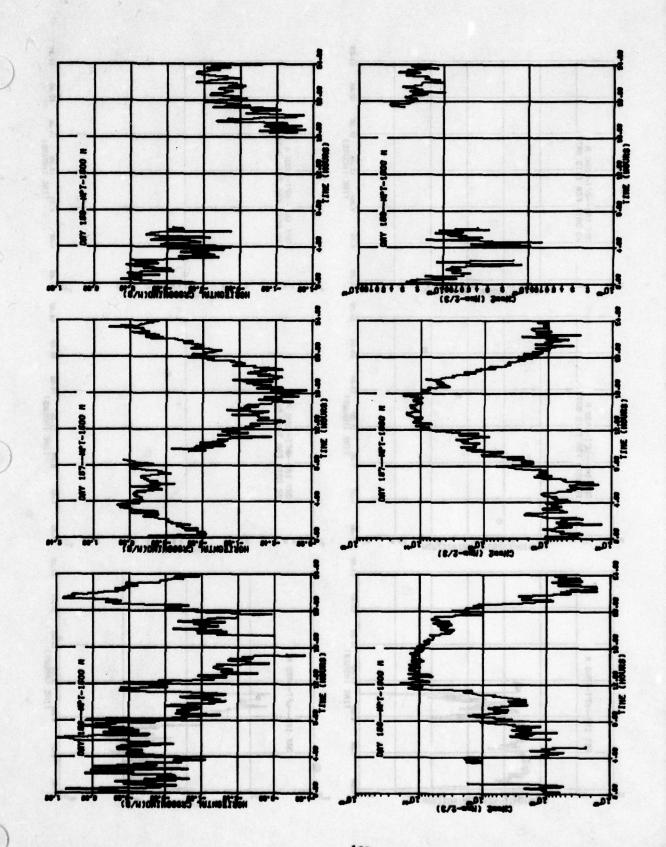


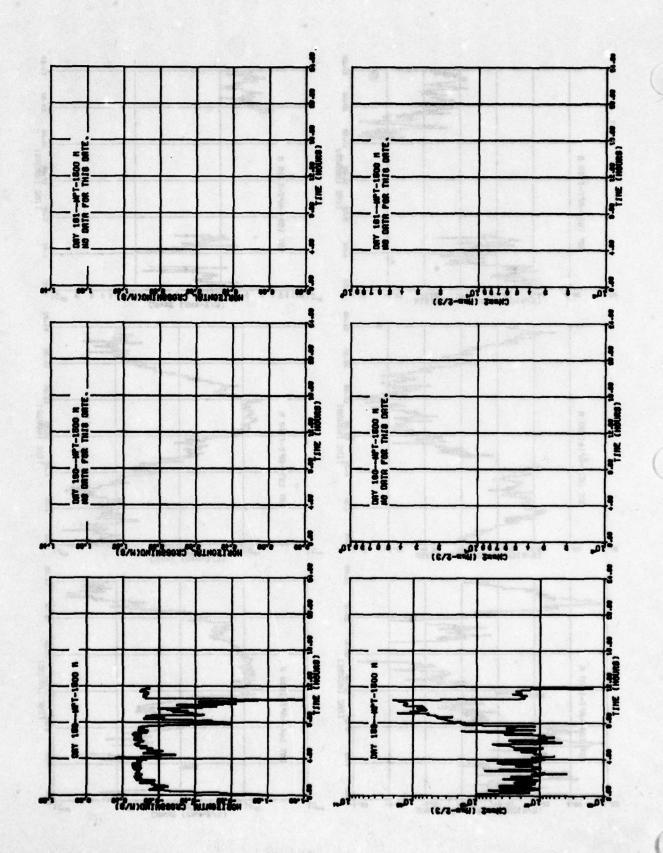


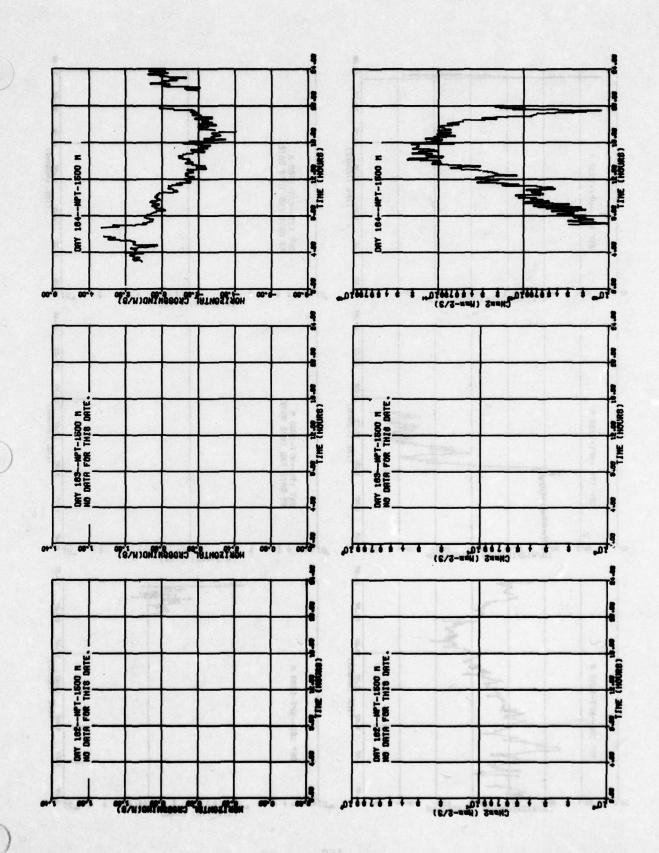


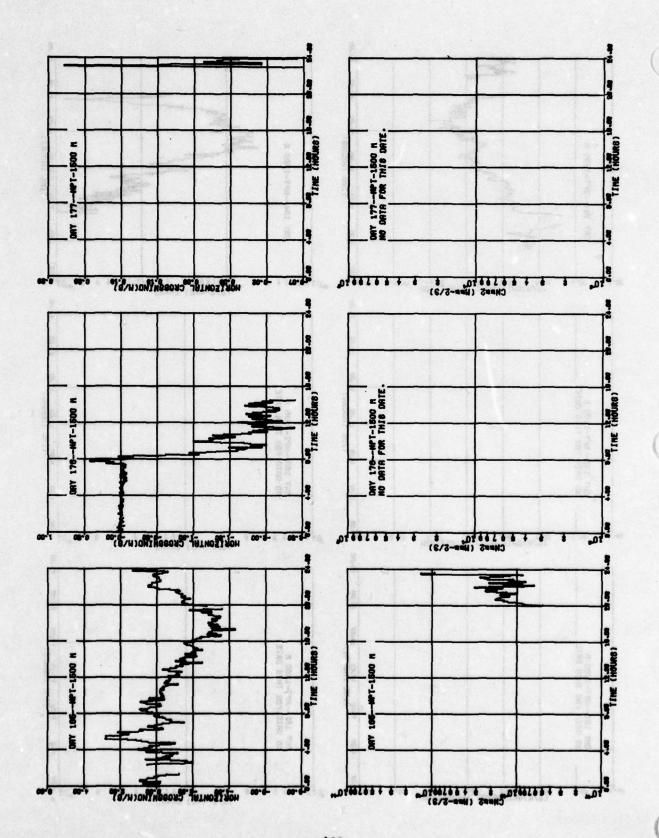


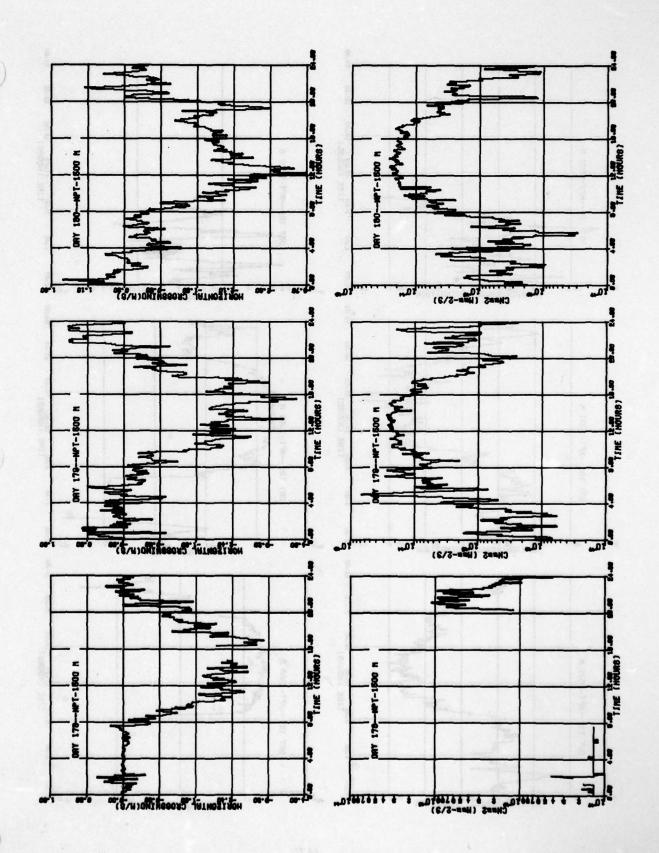


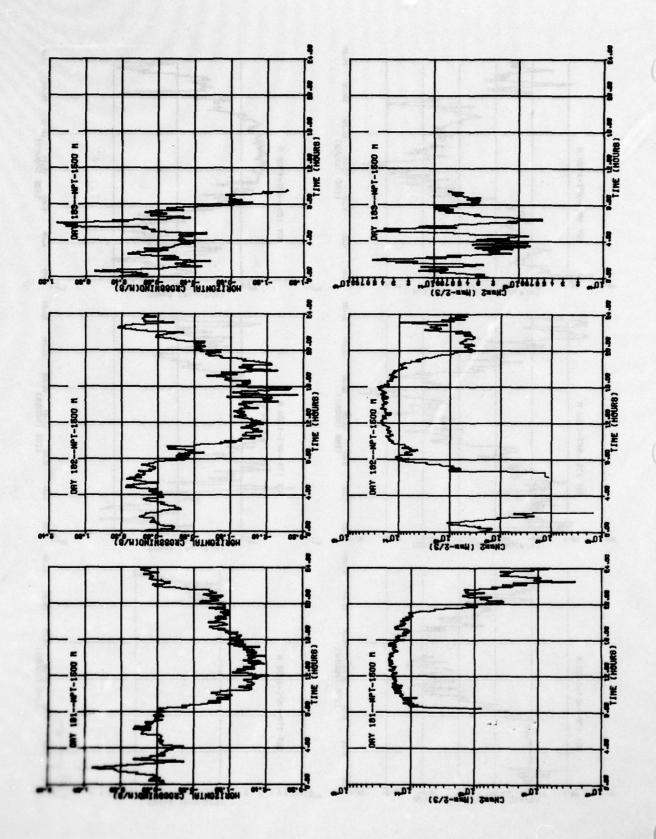


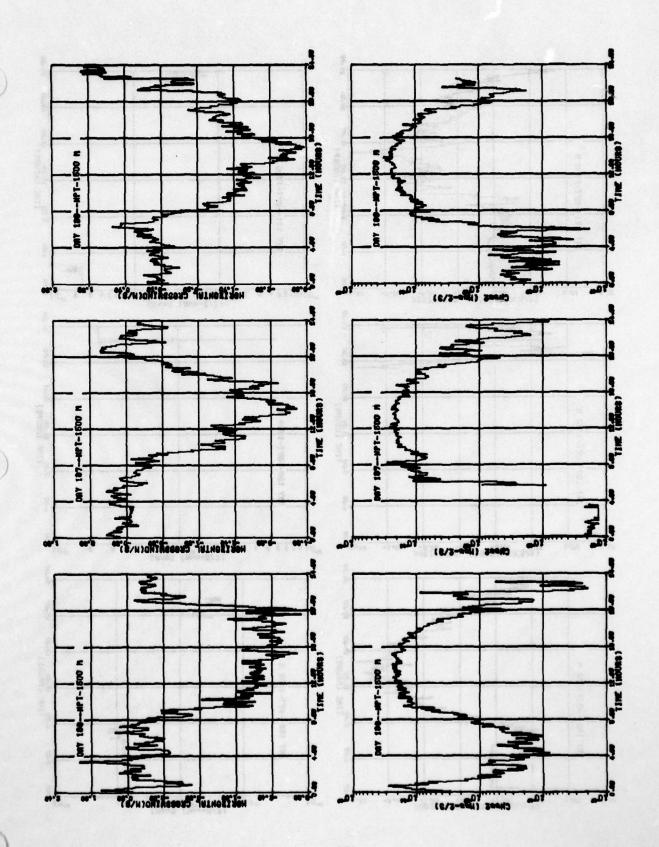


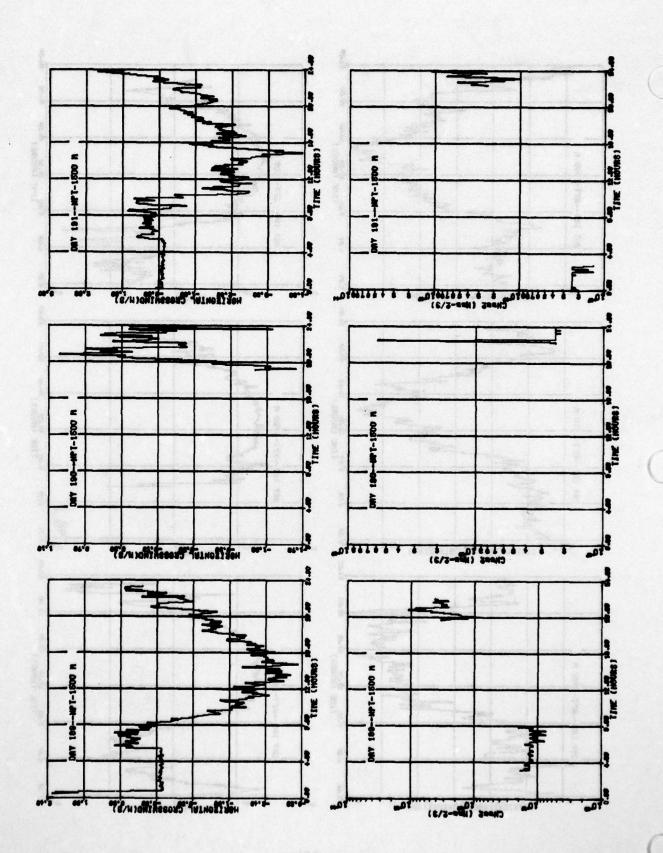


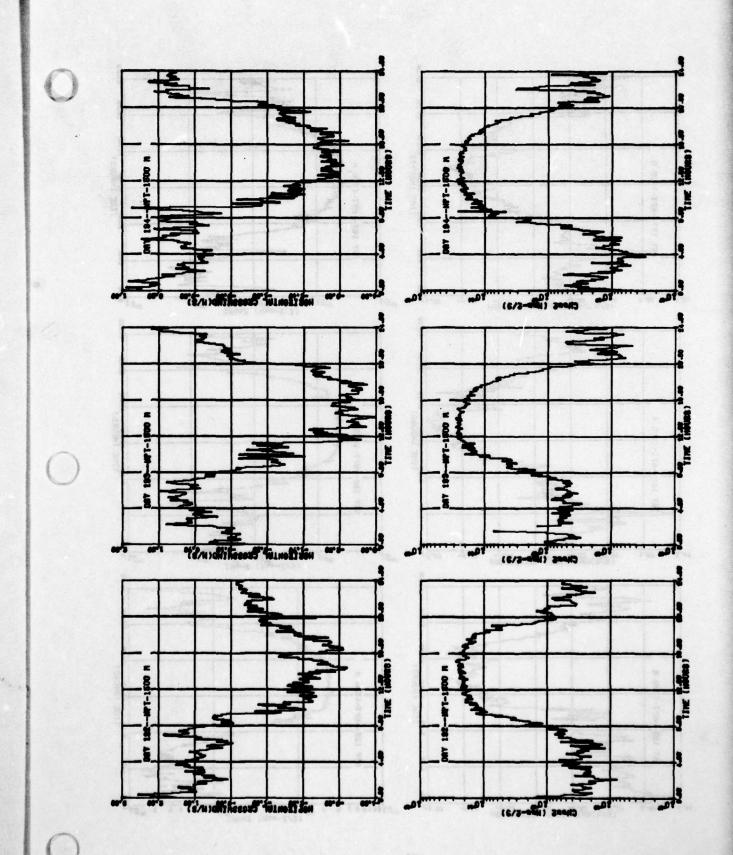


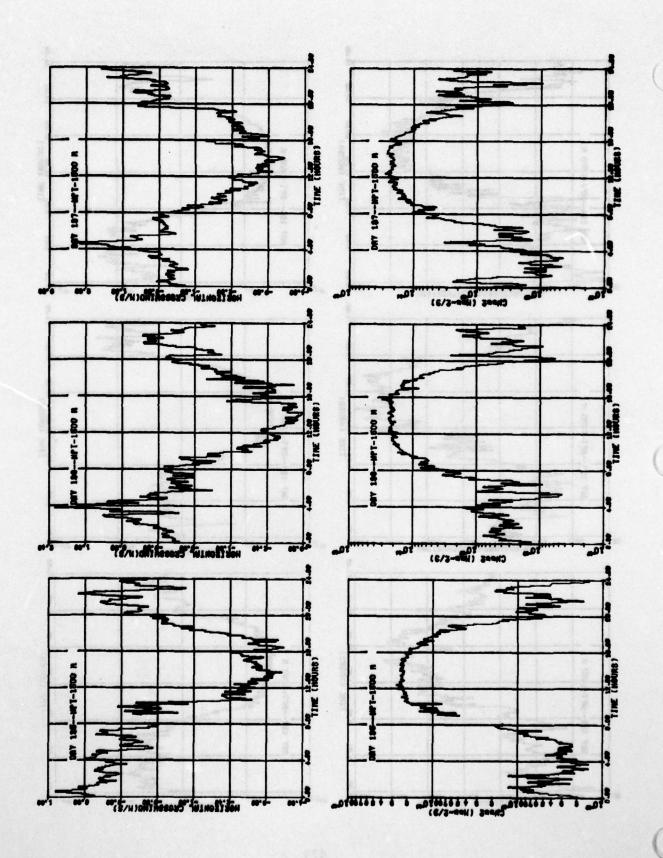


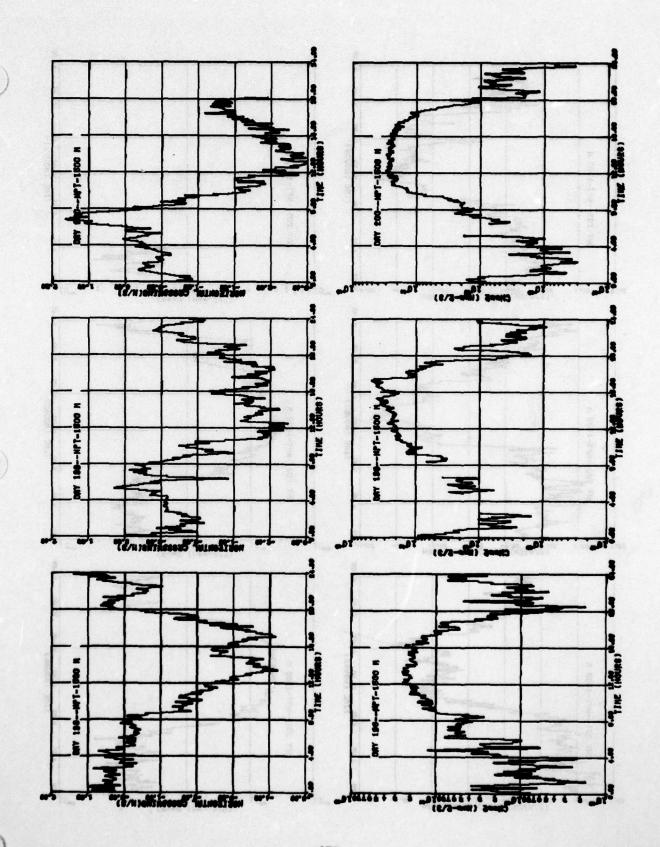


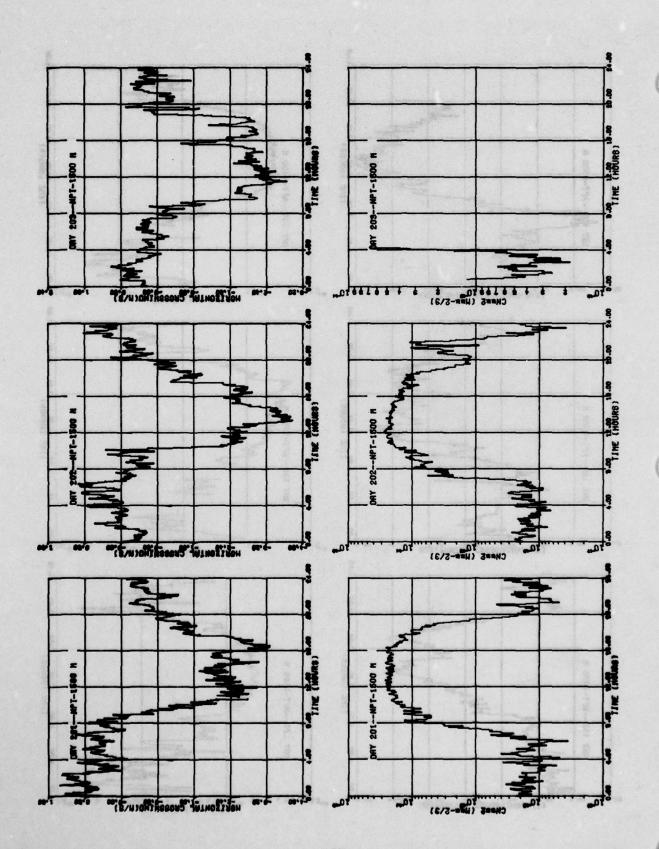


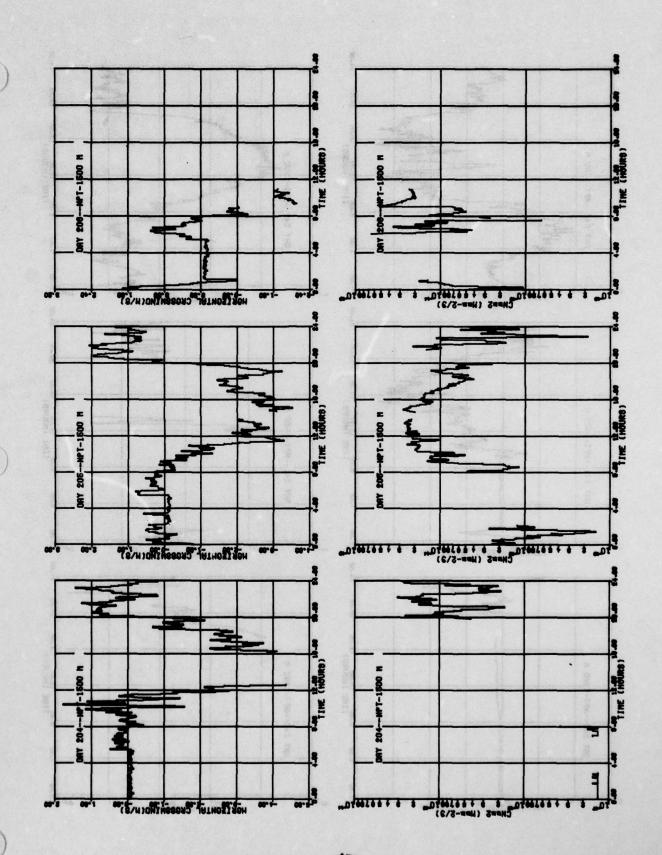


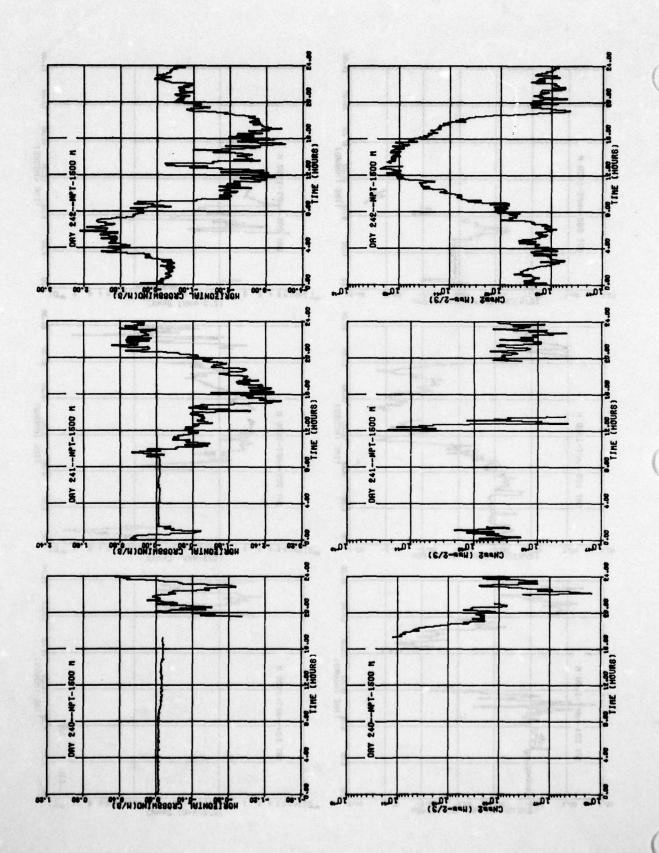


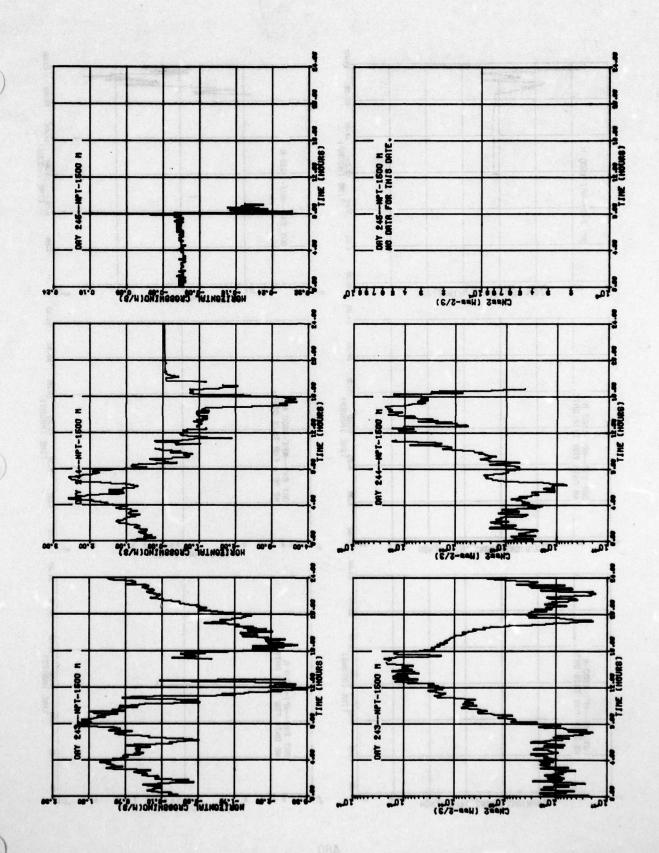


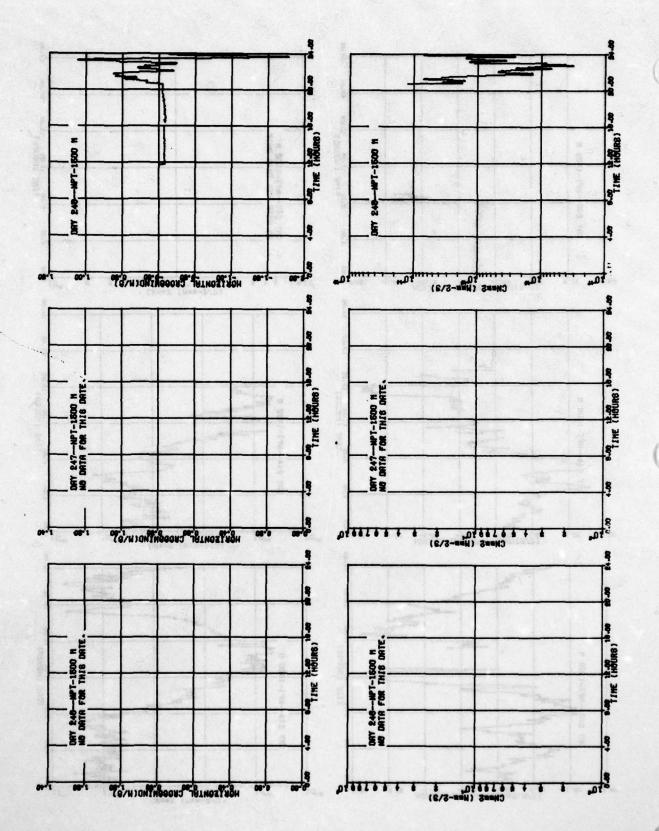


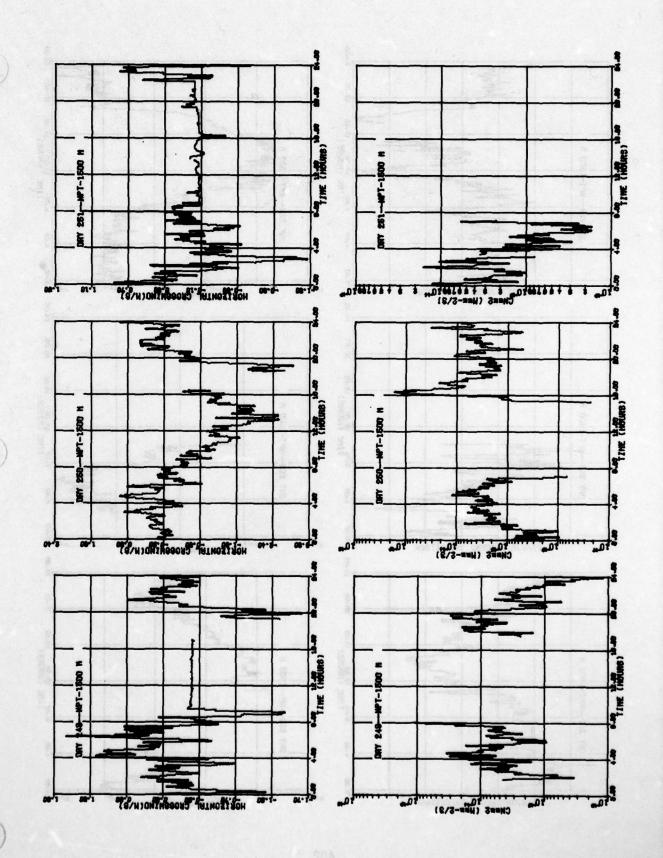


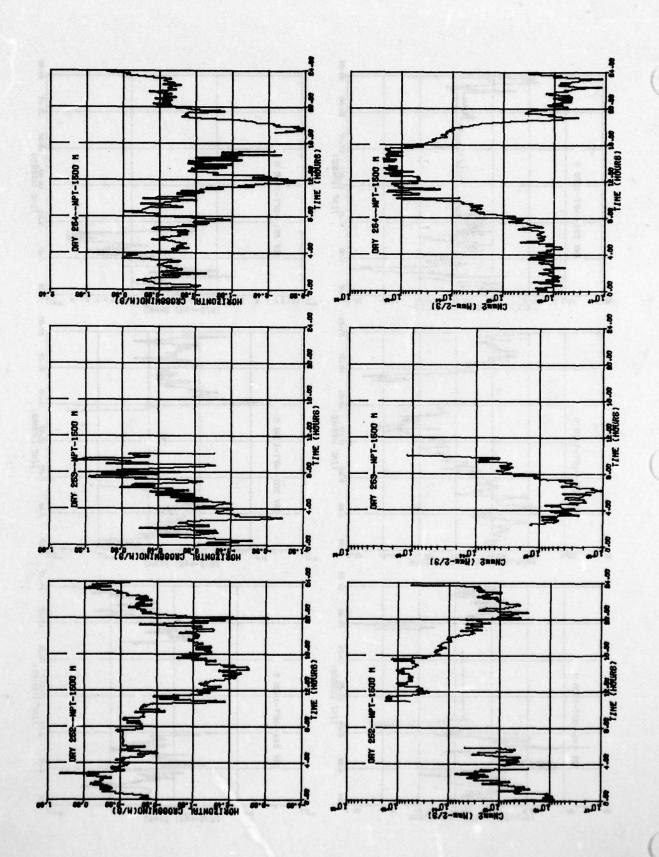


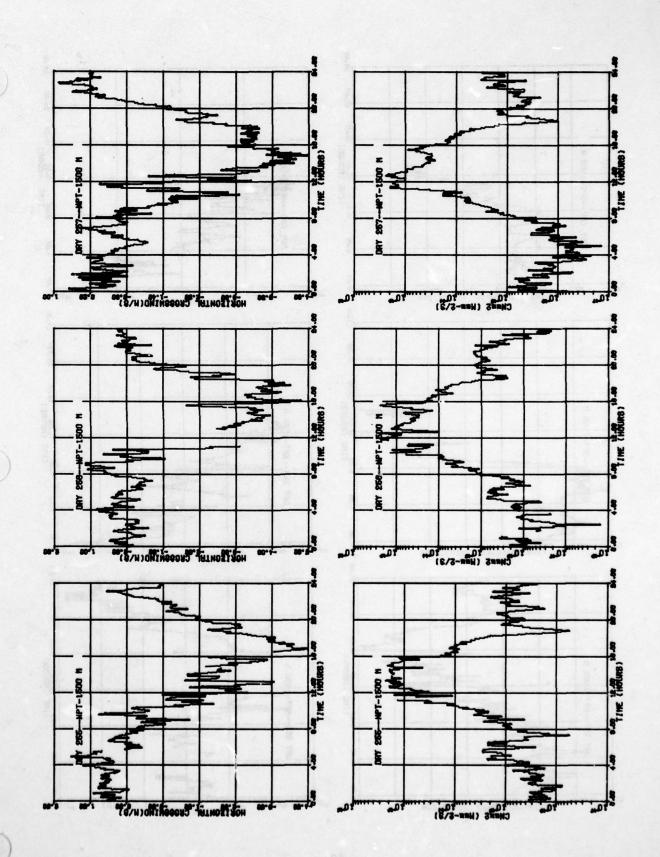


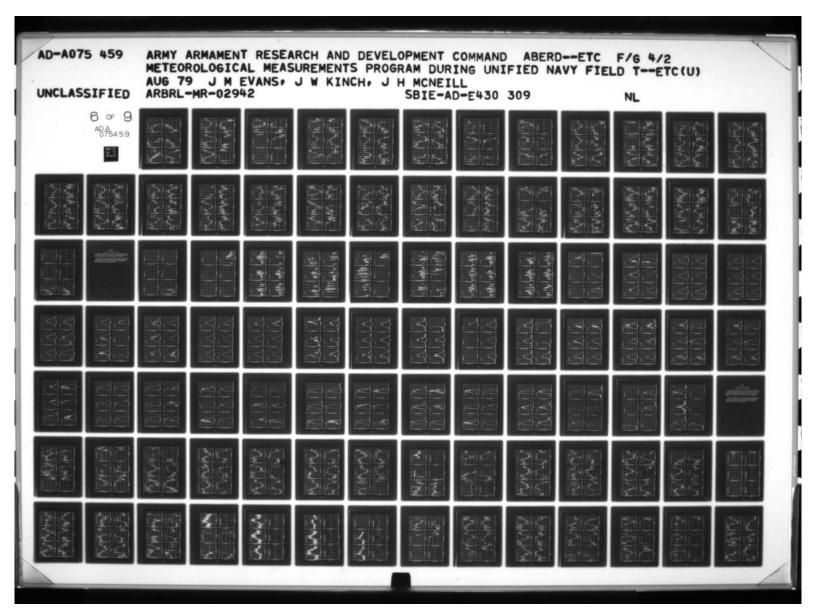


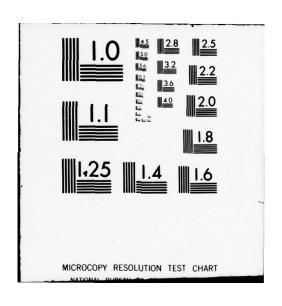


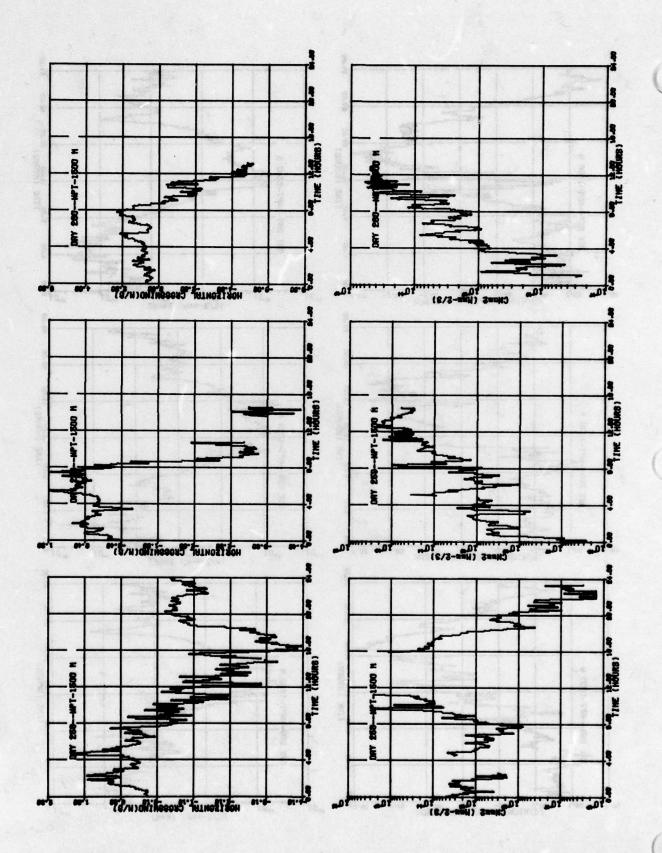


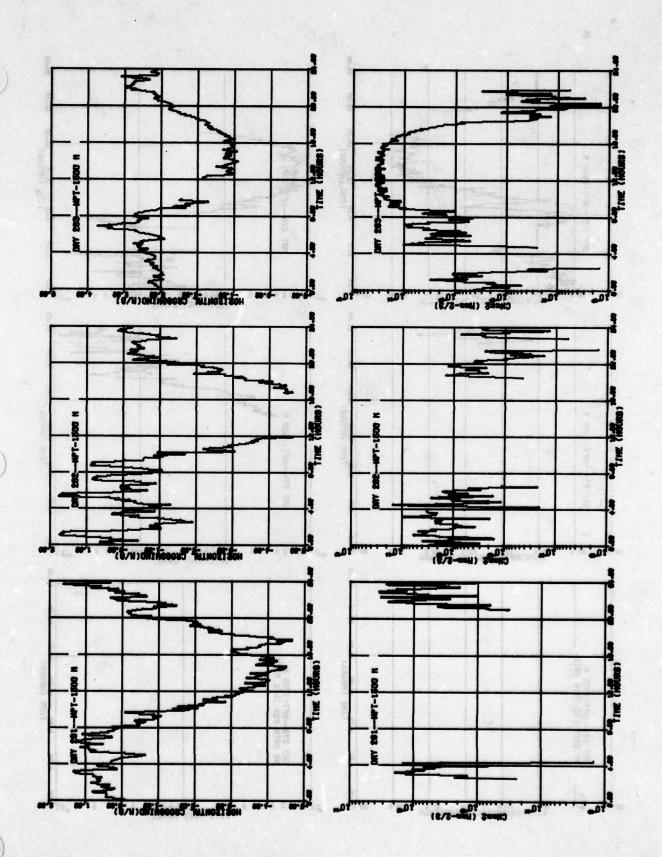


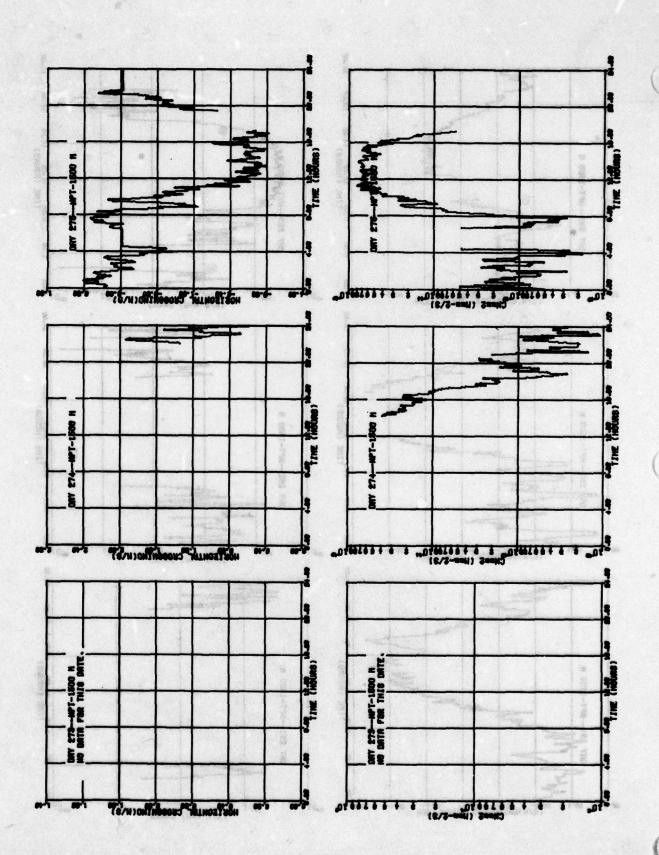


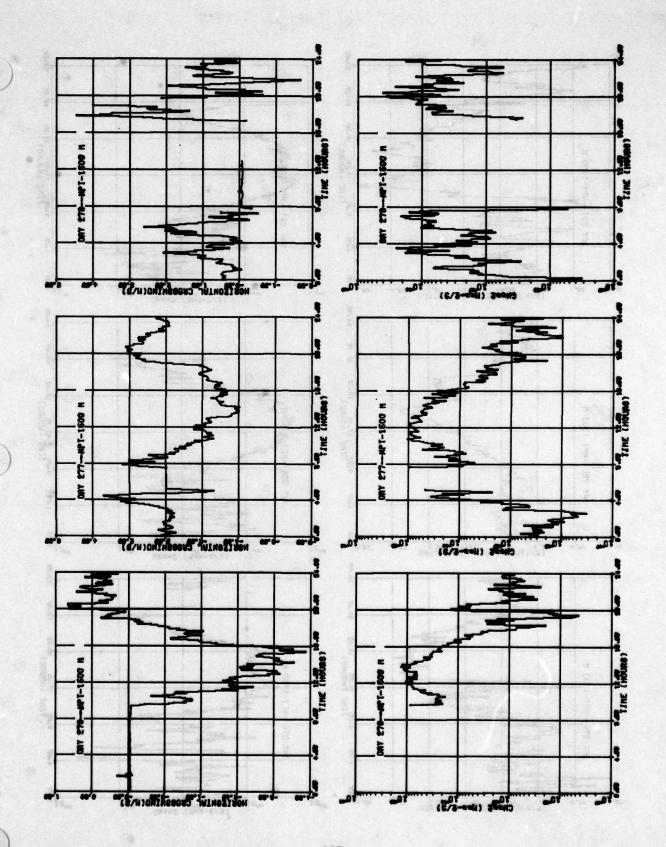


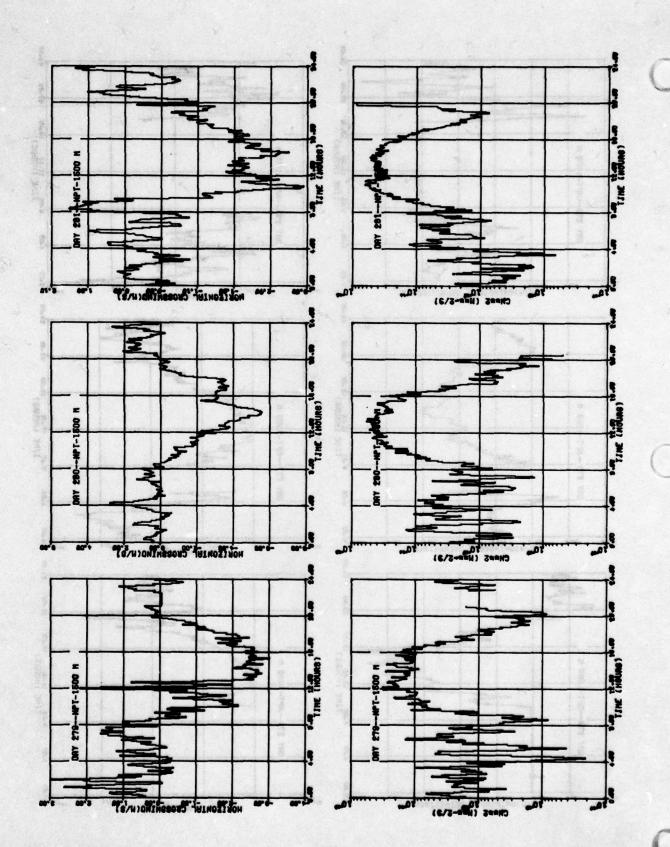


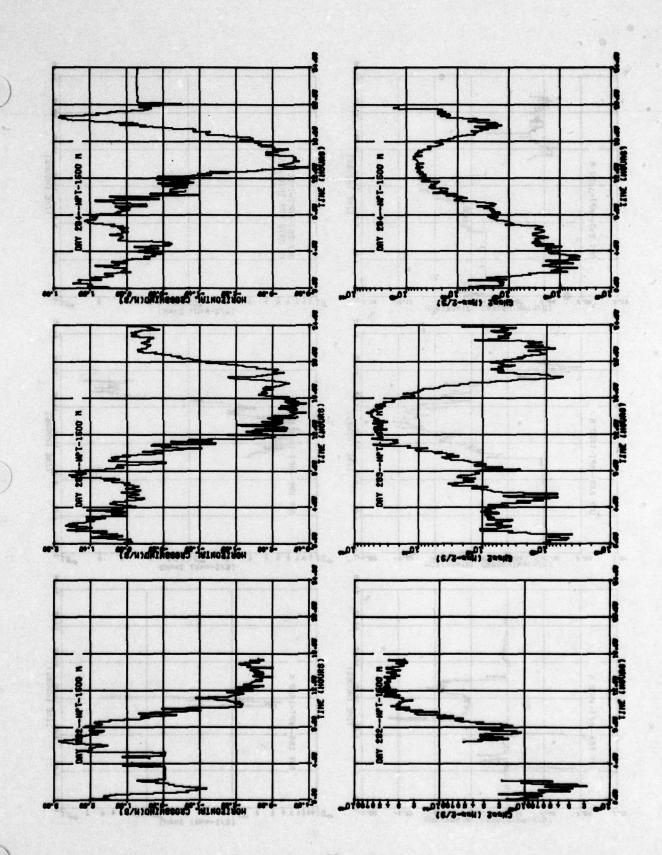


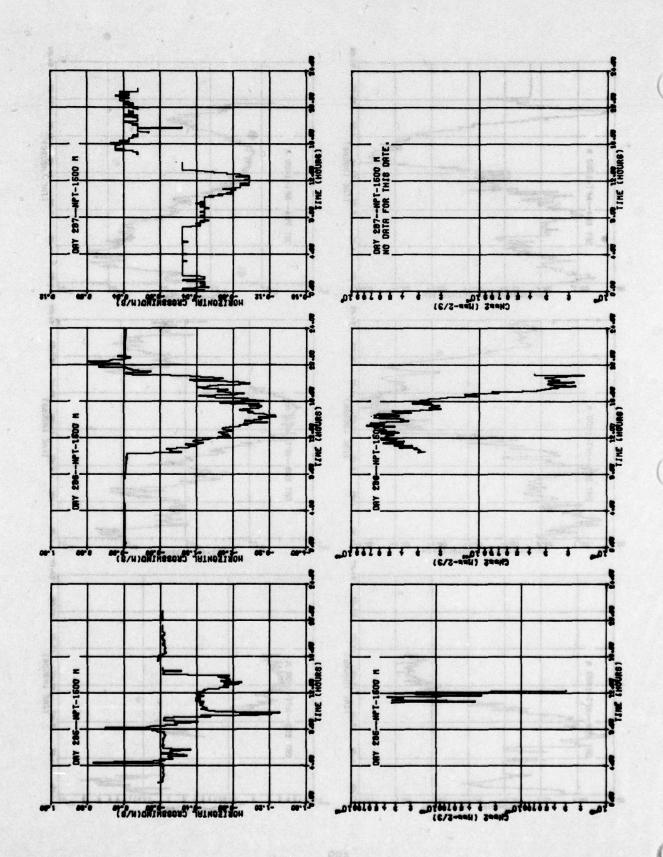


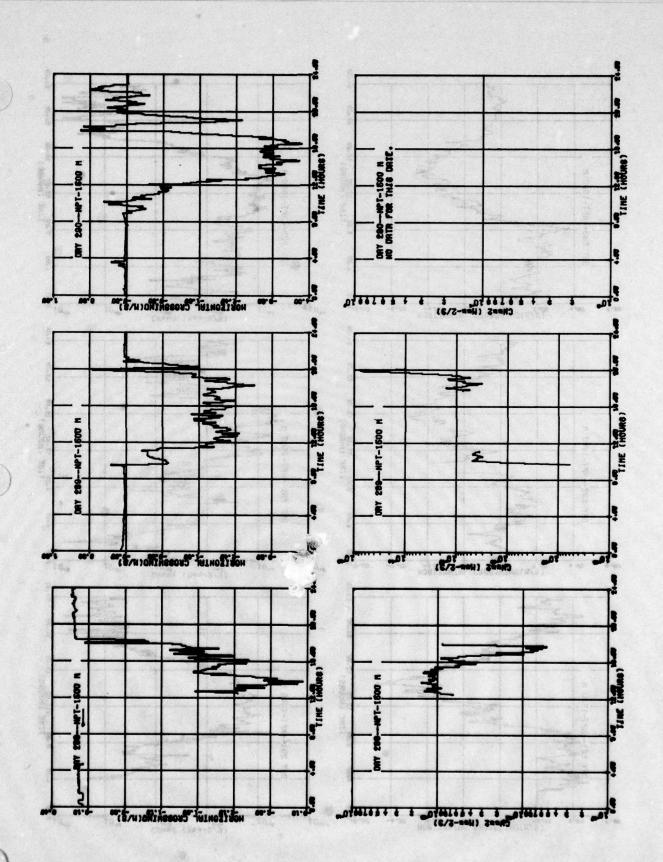


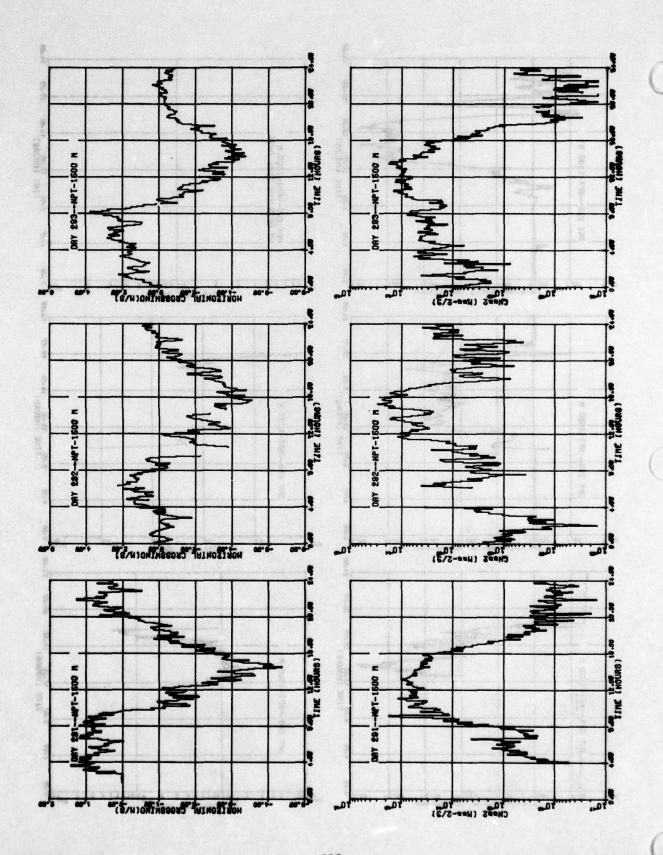


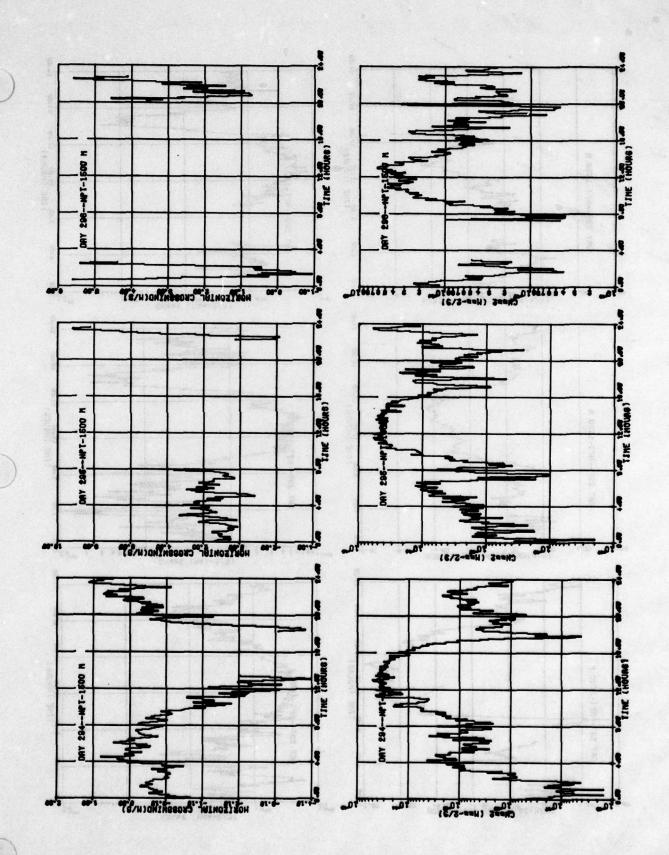


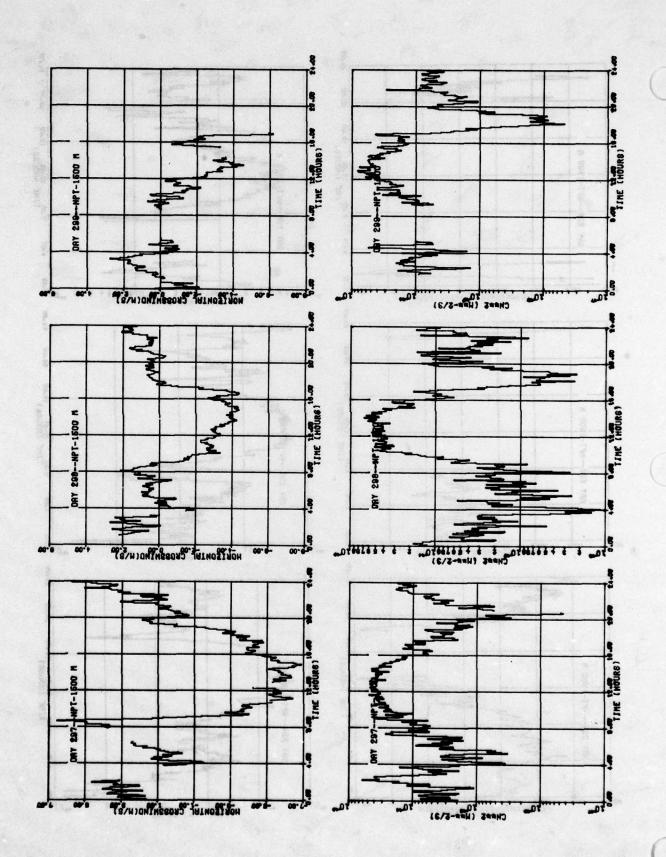


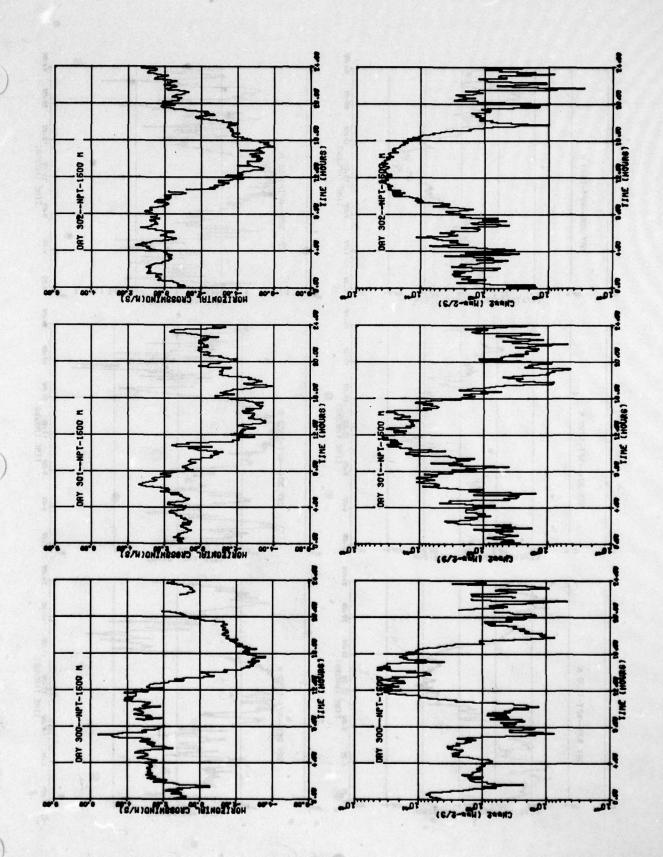


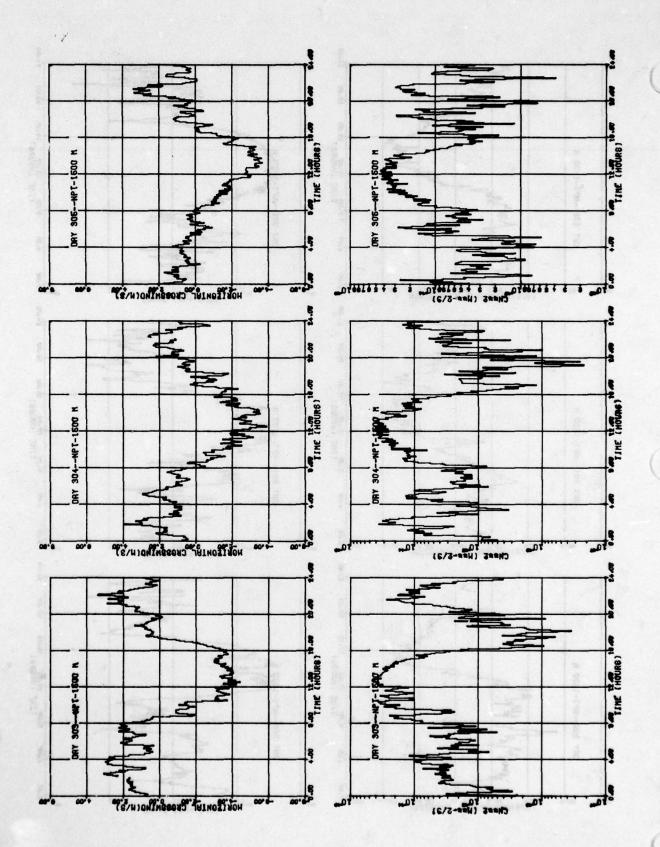


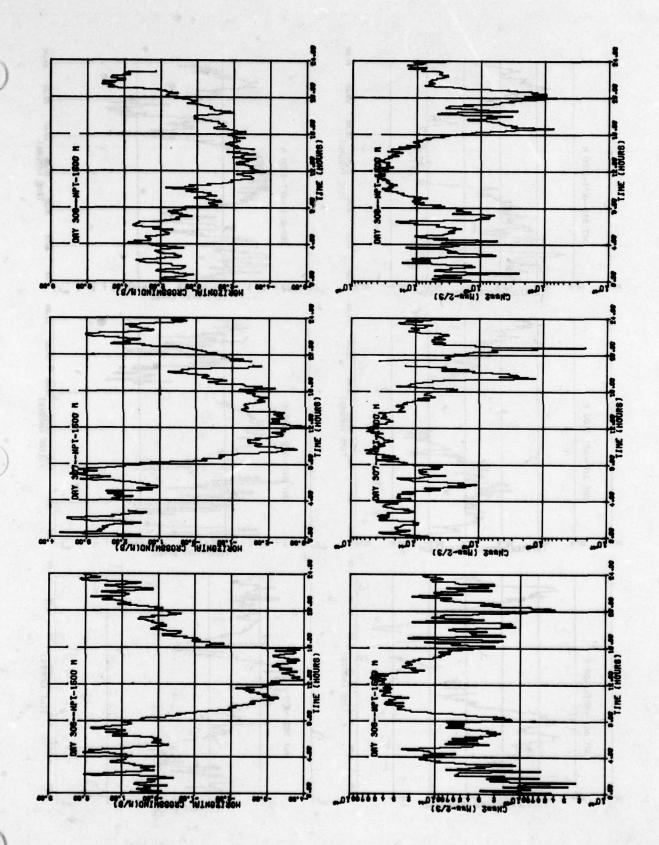


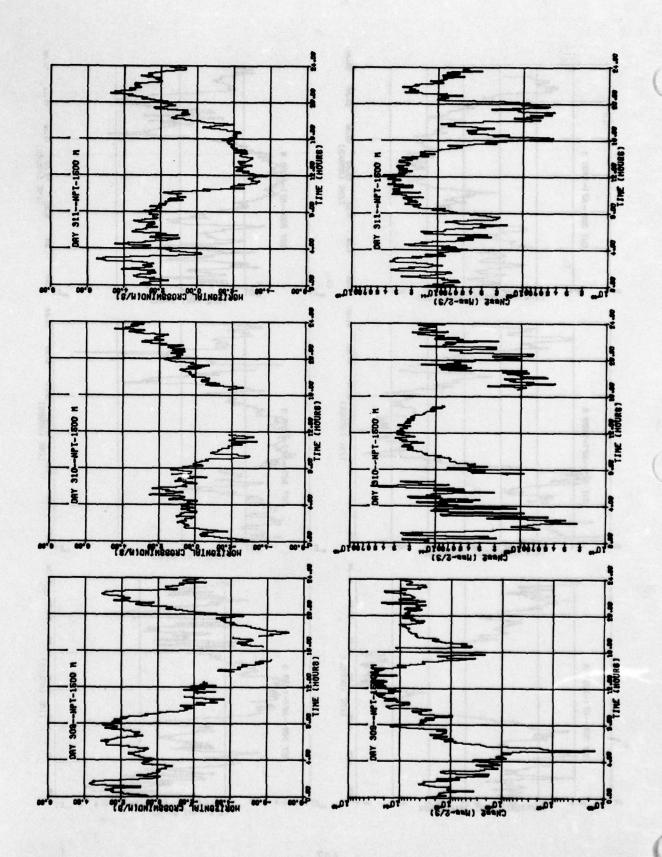


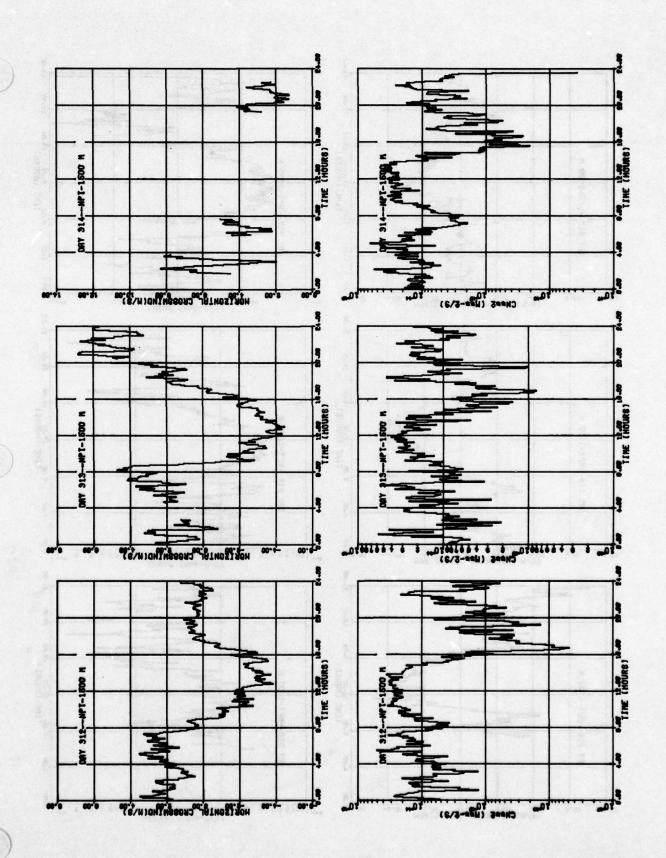


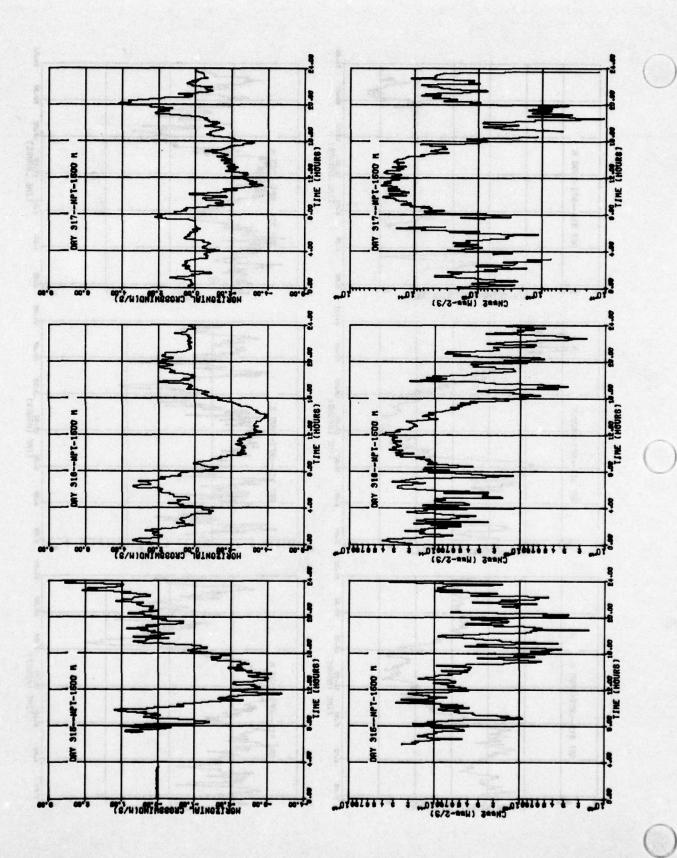


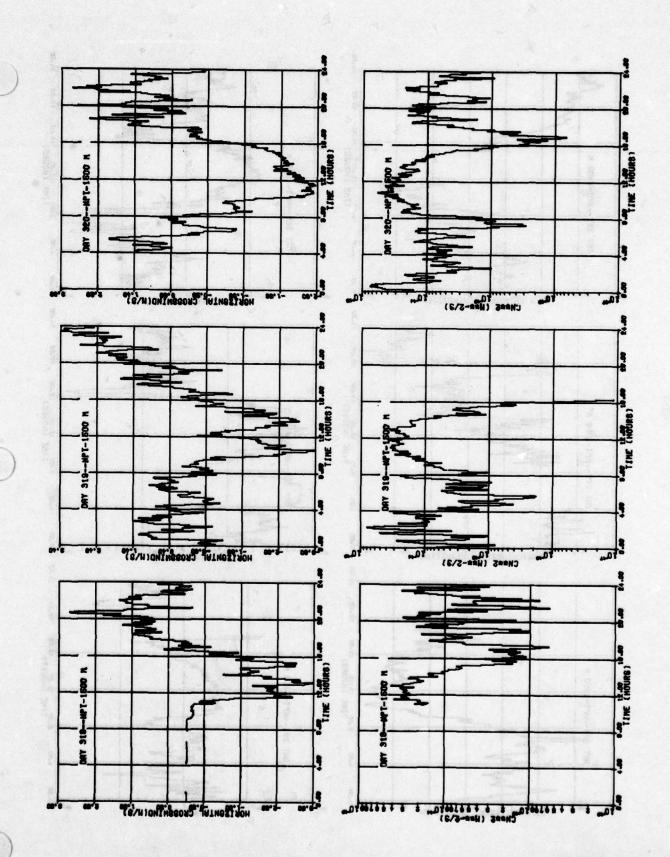


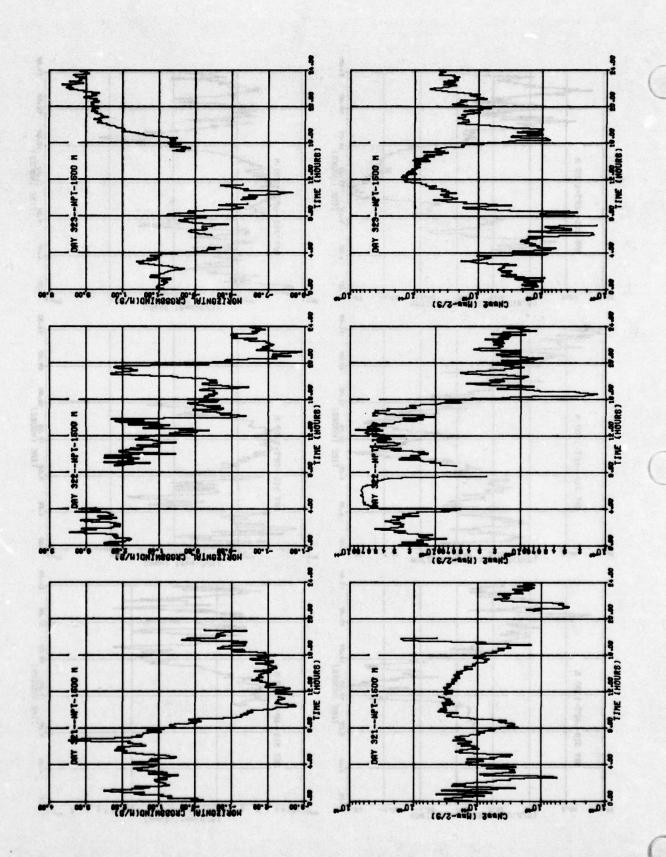


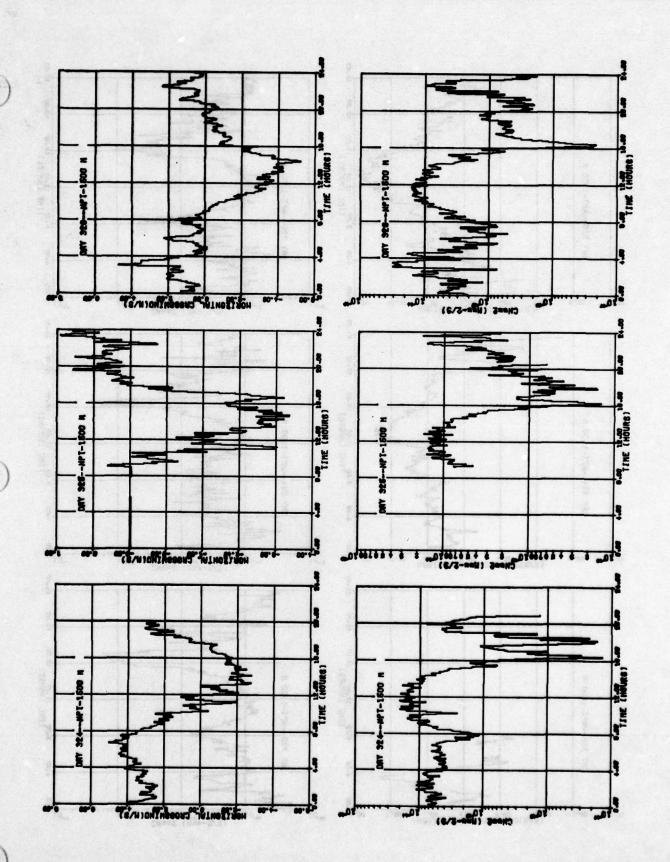


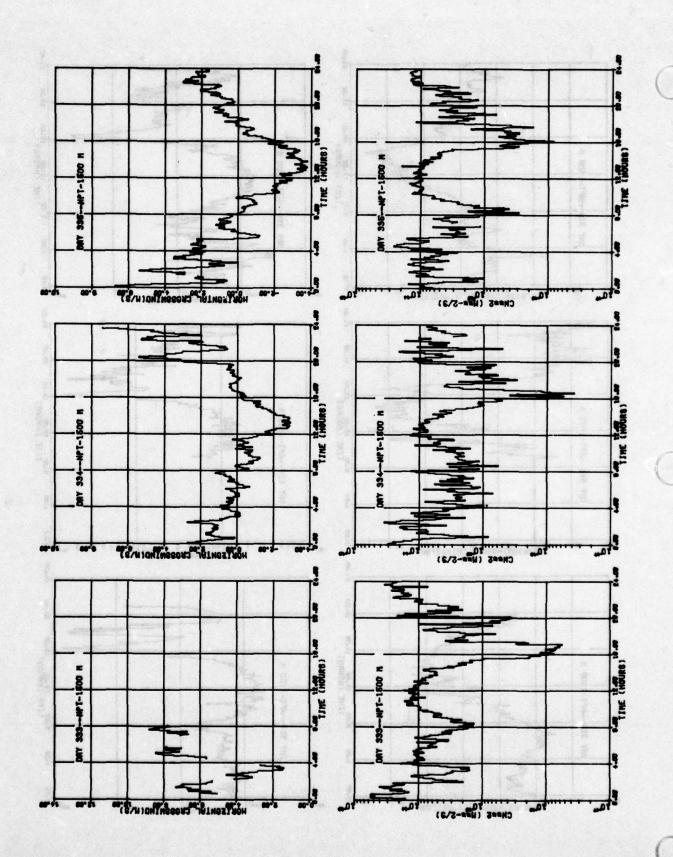


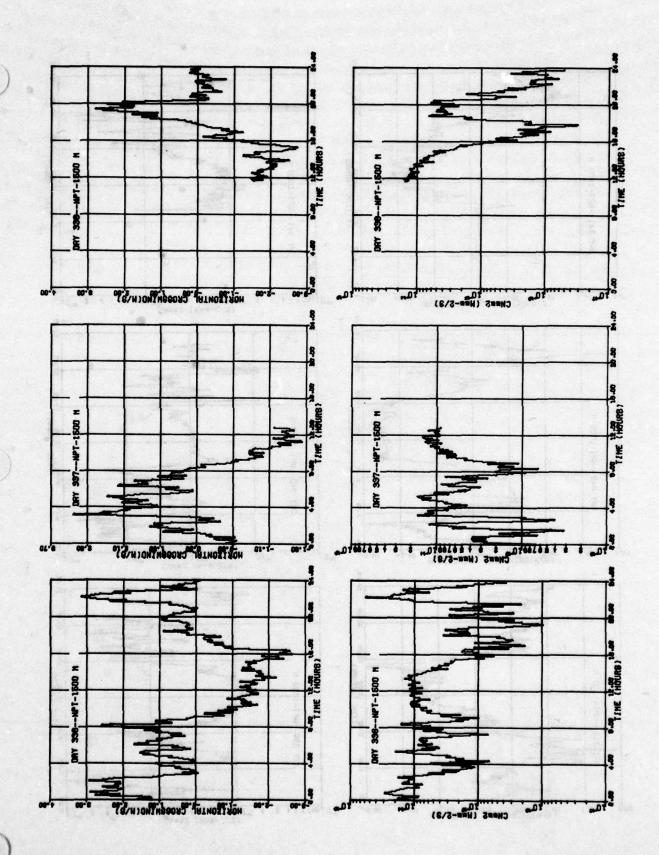


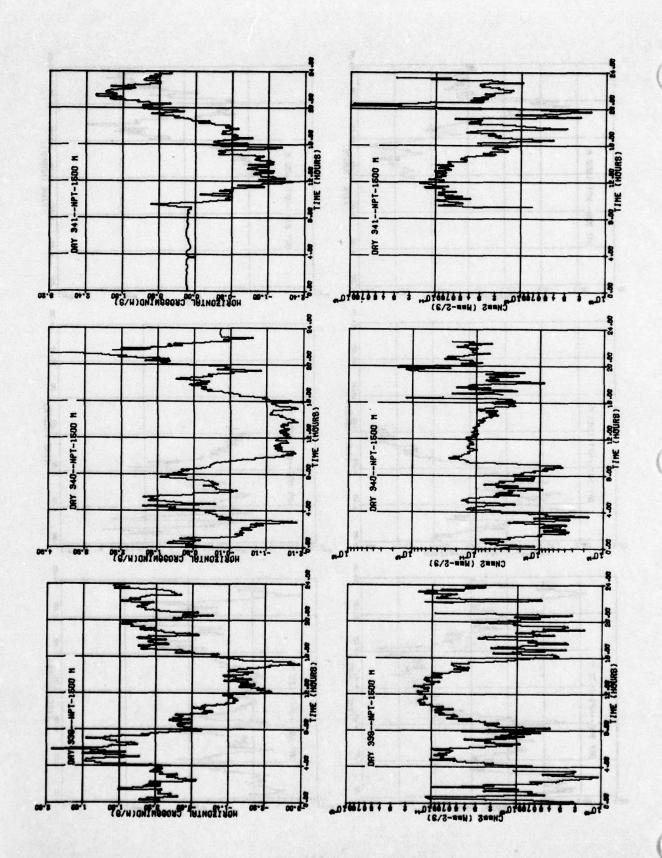


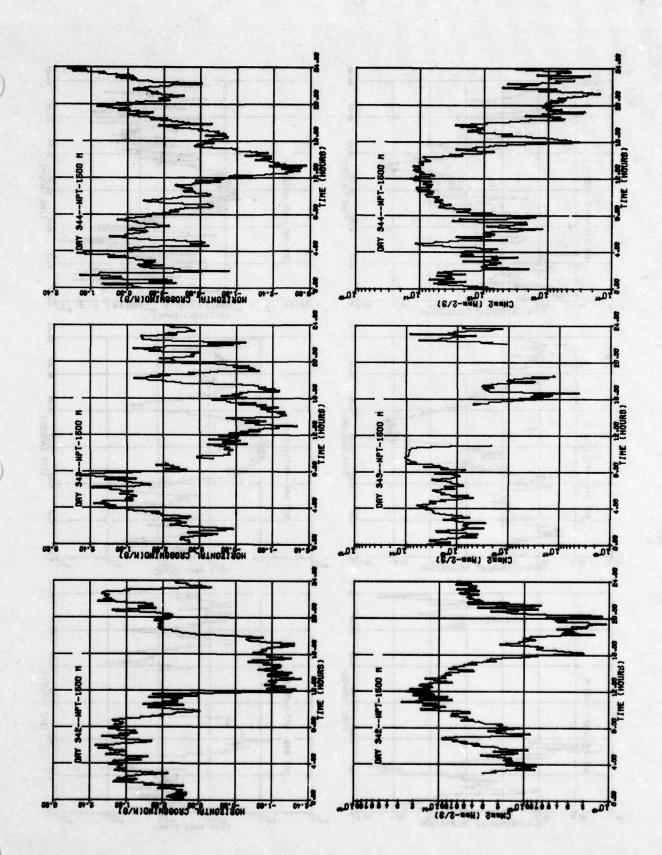


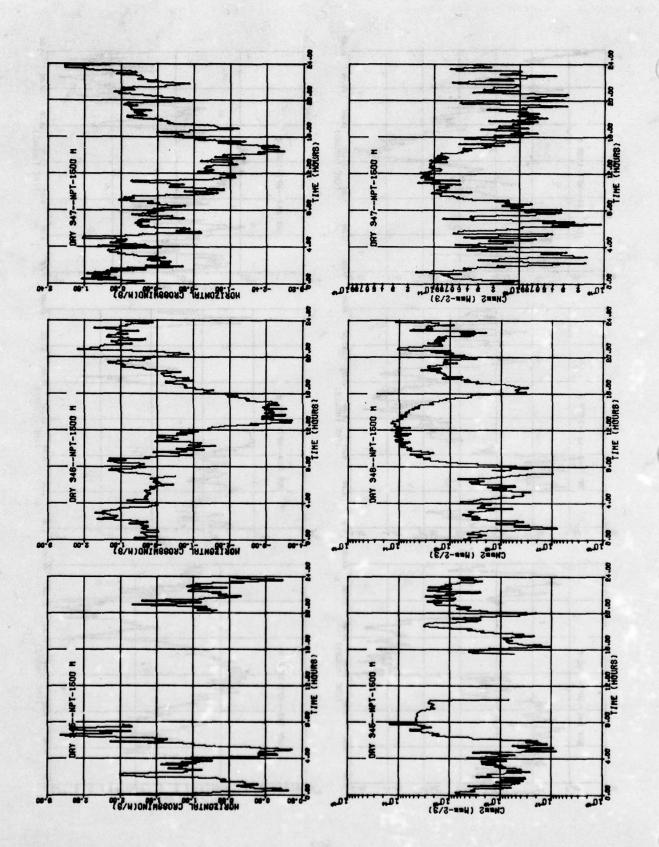


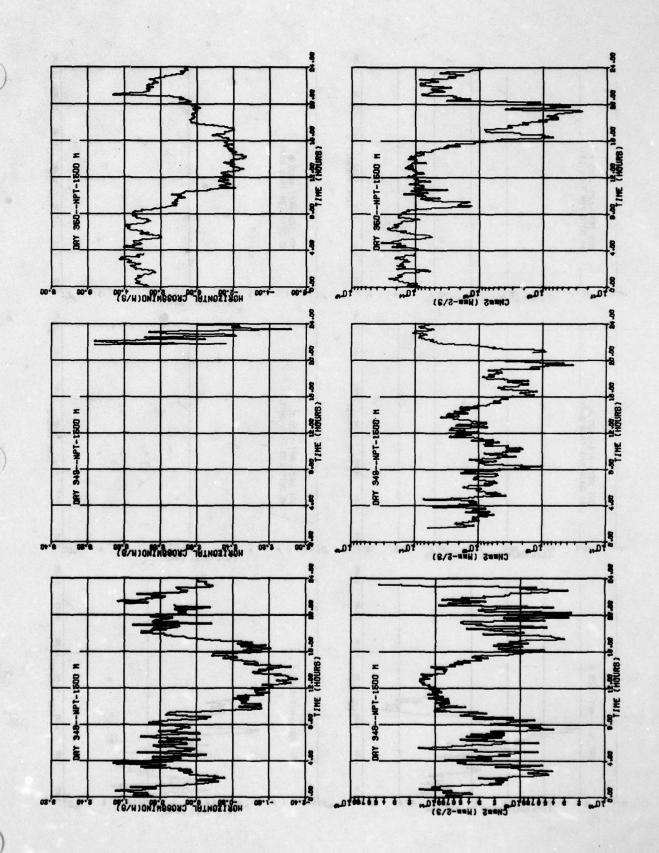


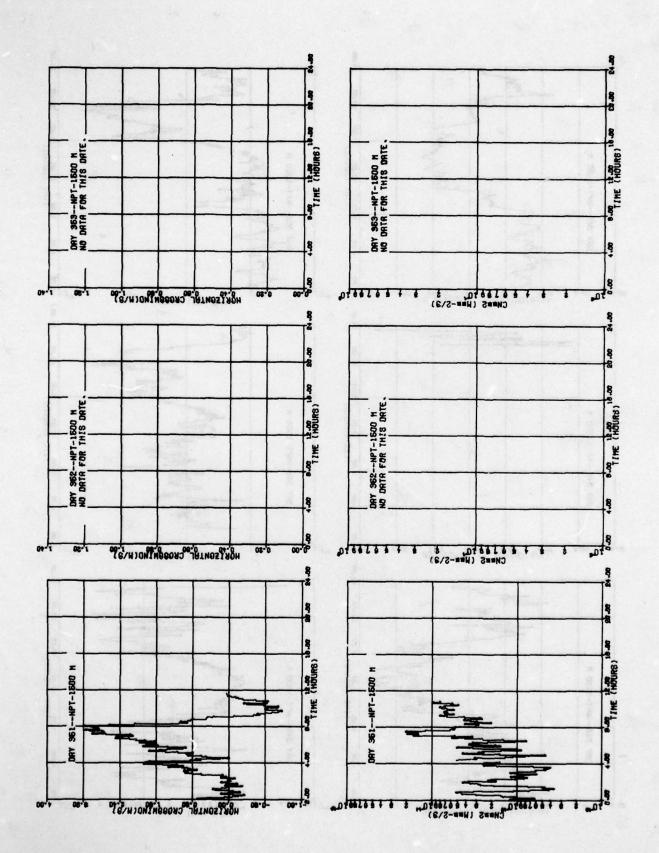










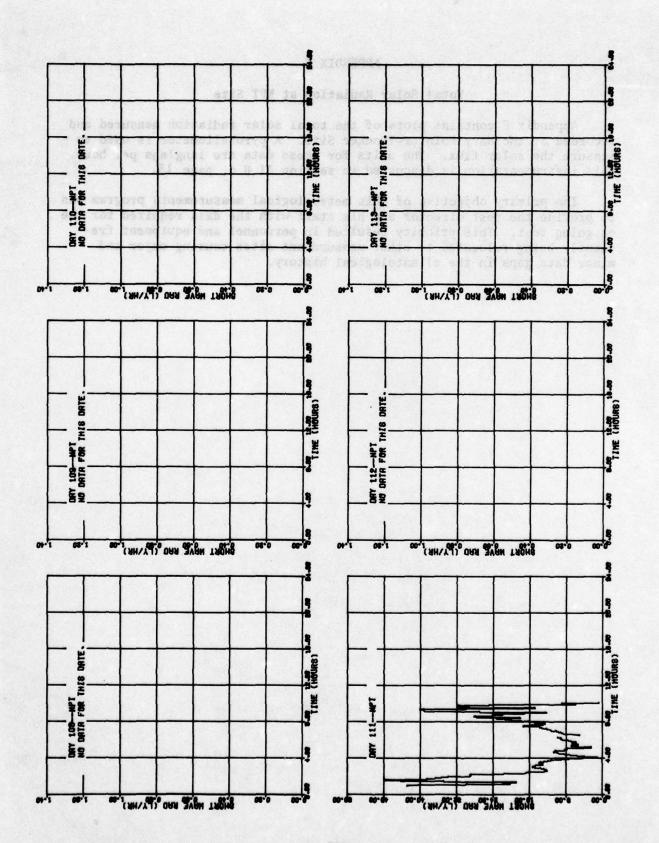


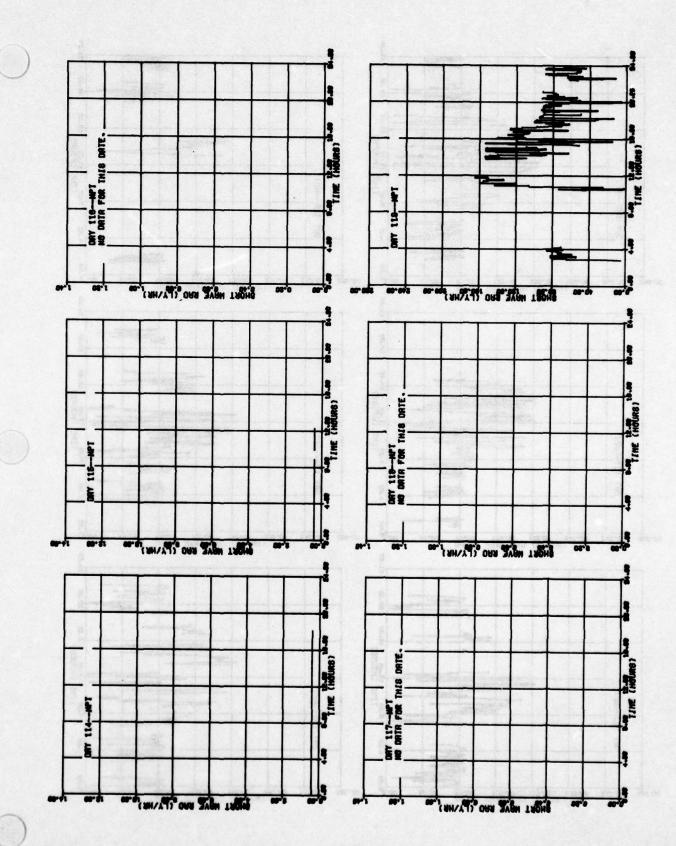
APPENDIX F

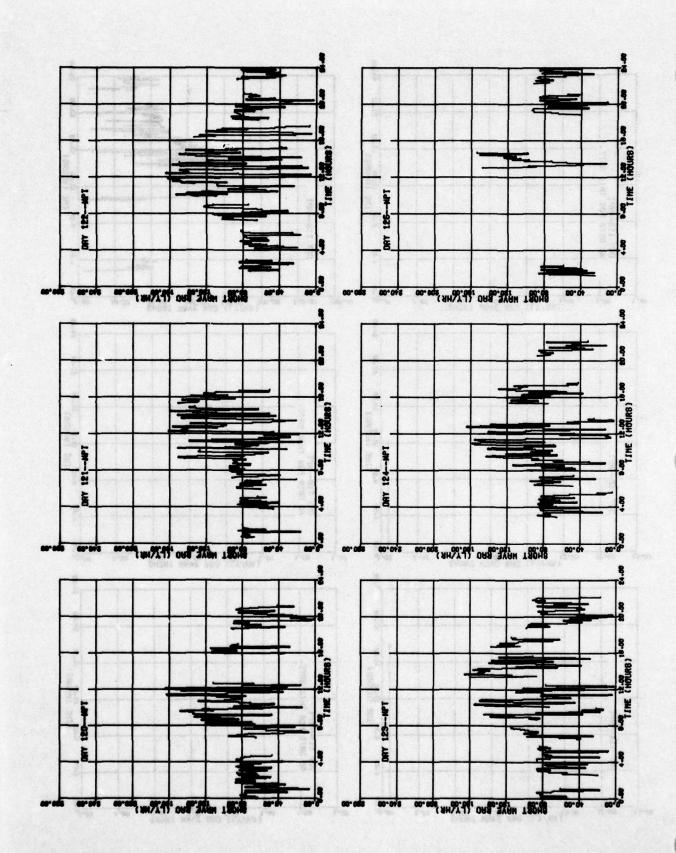
Total Solar Radiation at NPT Site

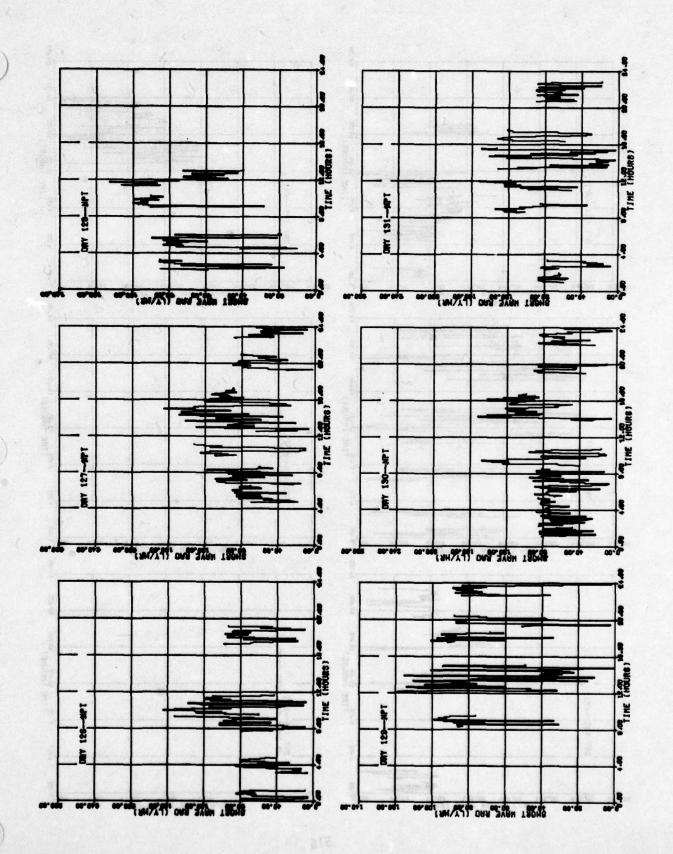
Appendix F contains plots of the total solar radiation measured and recorded at the Navy Pointer-Tracker Site. A pyroheliometer is used to measure the solar flux. The units for these data are langleys per hour. This instrumentation is discussed in section II B 6, page 13.

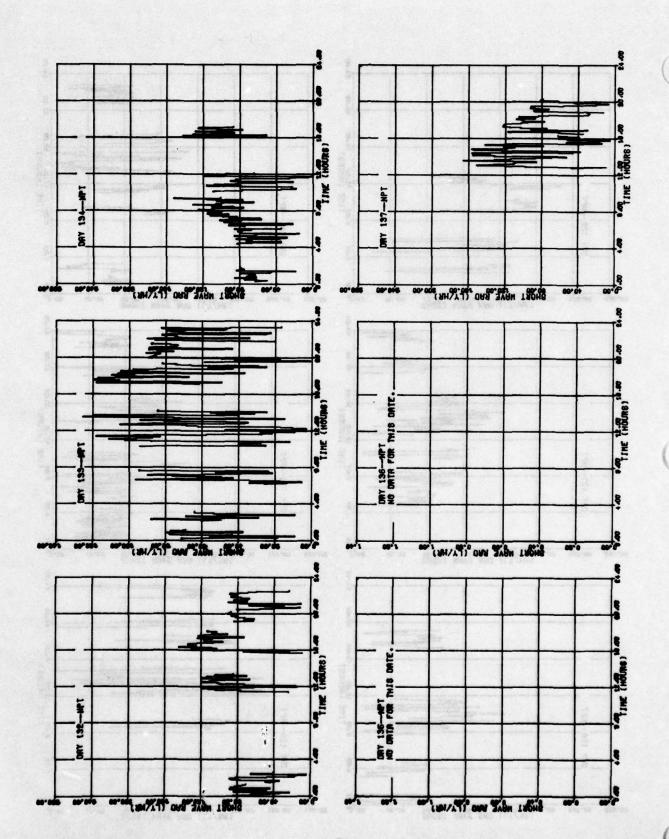
The primary objective of this meterological measurements program was to provide the test director and his staff with the data required for the on going test. This priority resulted in personnel and equipment frequently being relocated to other measurement sites causing major and minor data gaps in the climatological history.

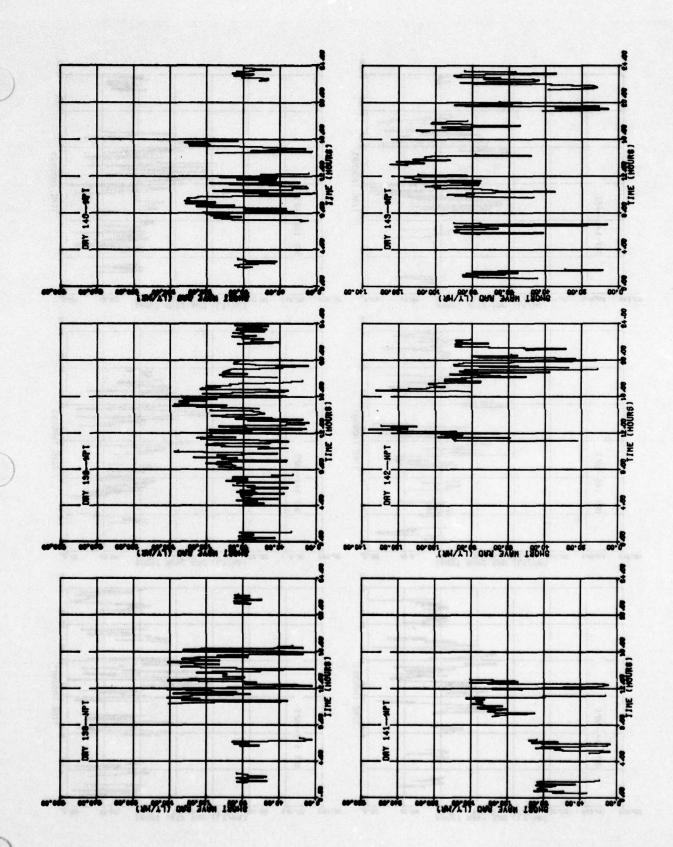


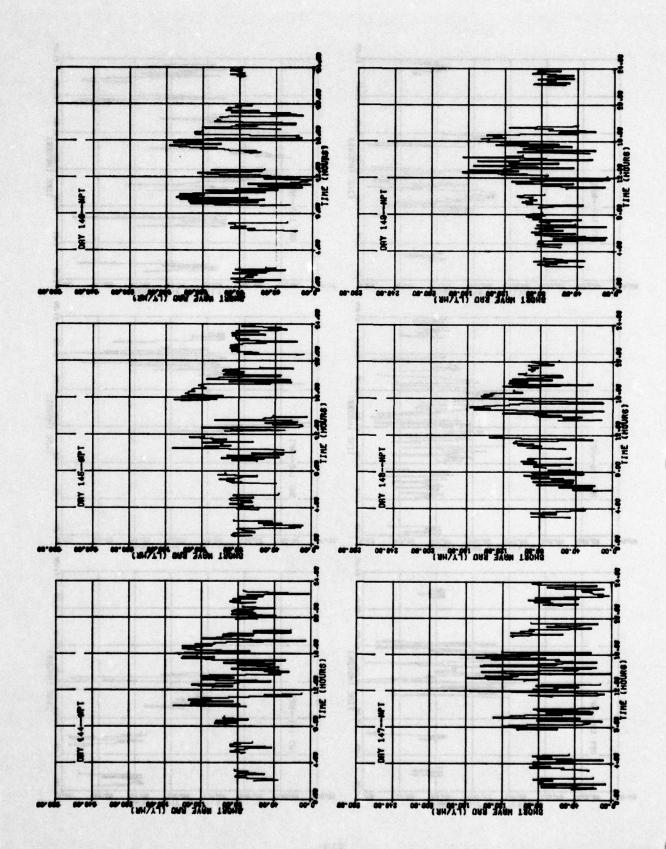


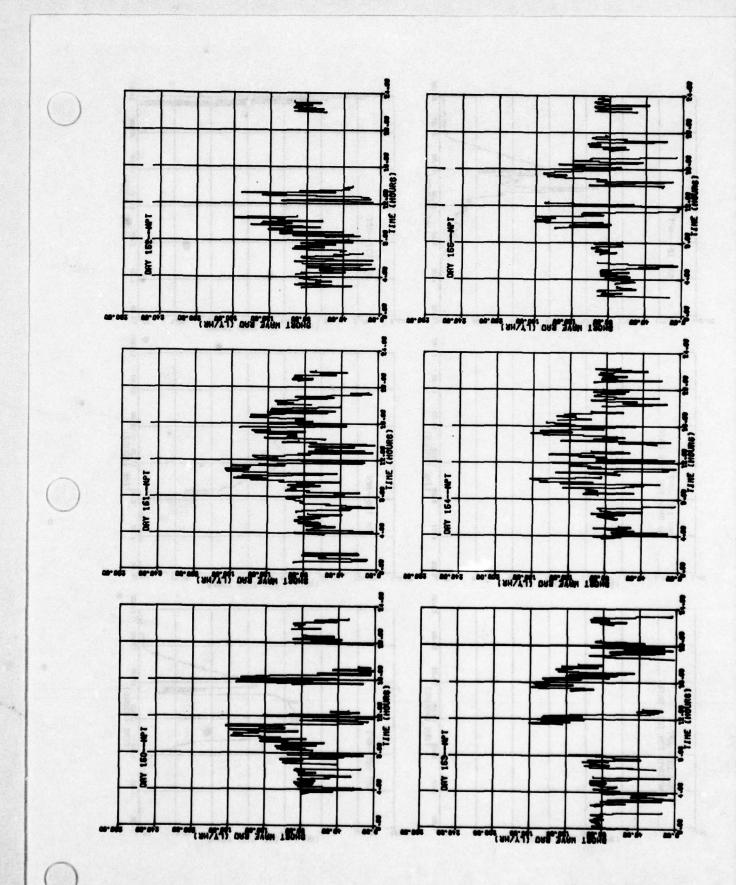


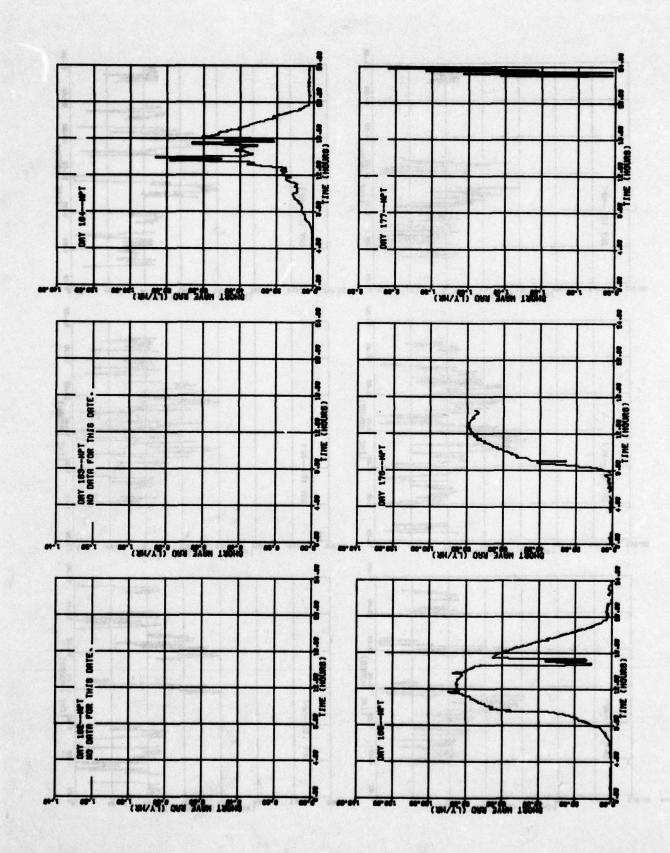


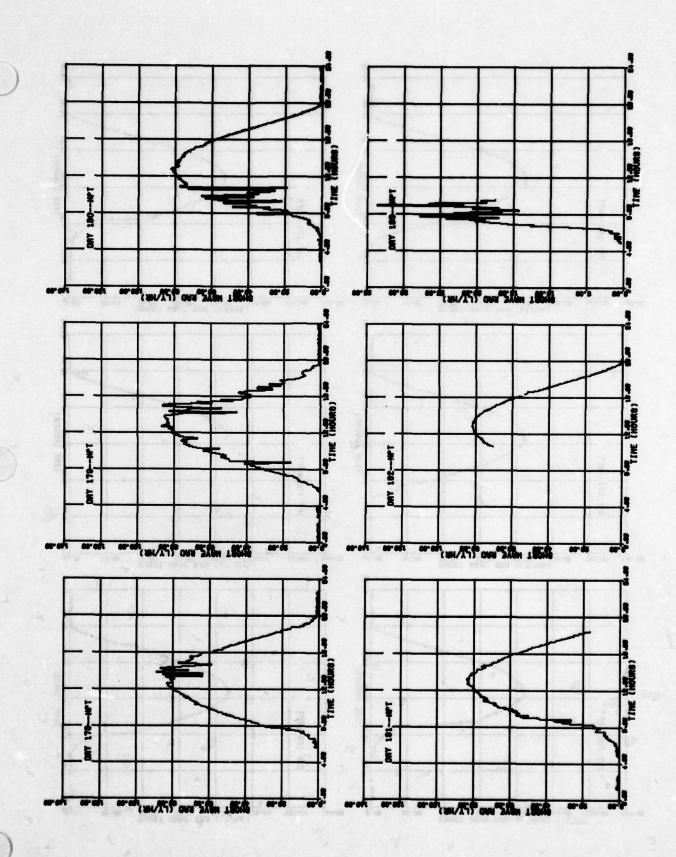


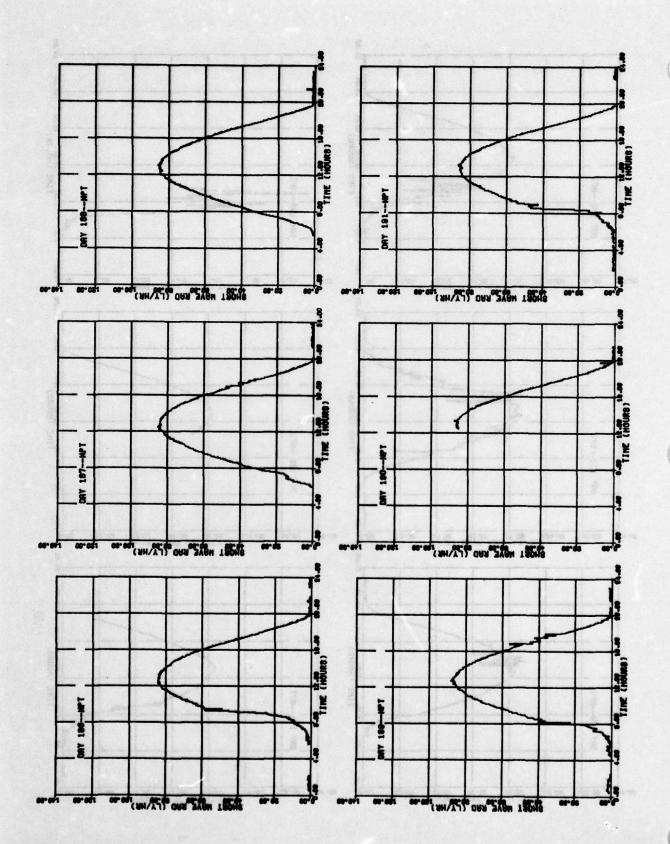


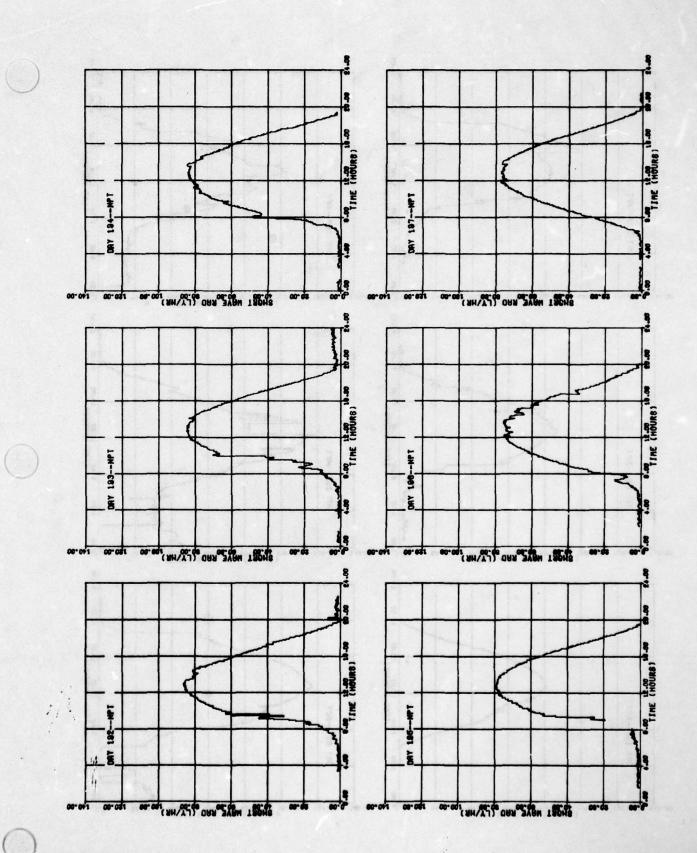


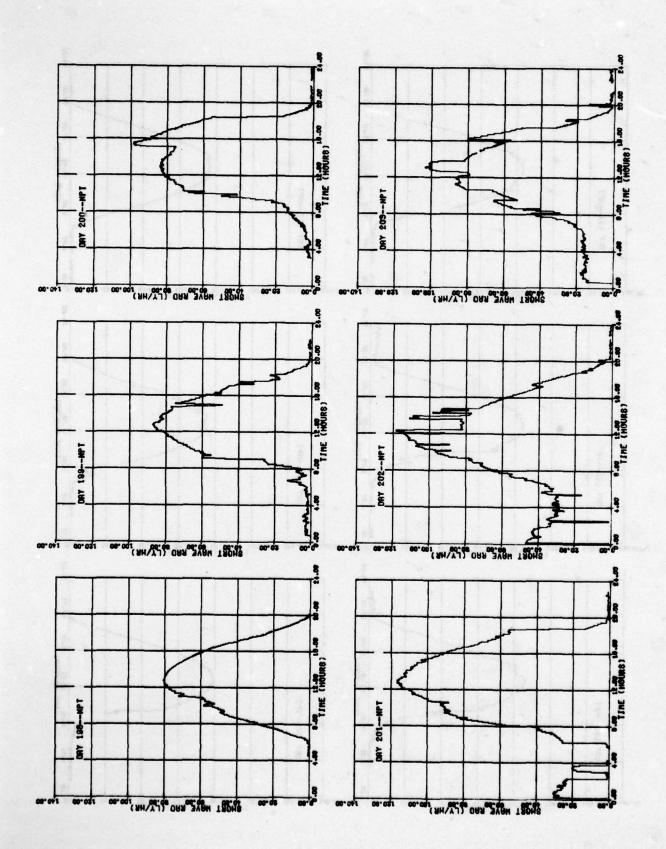


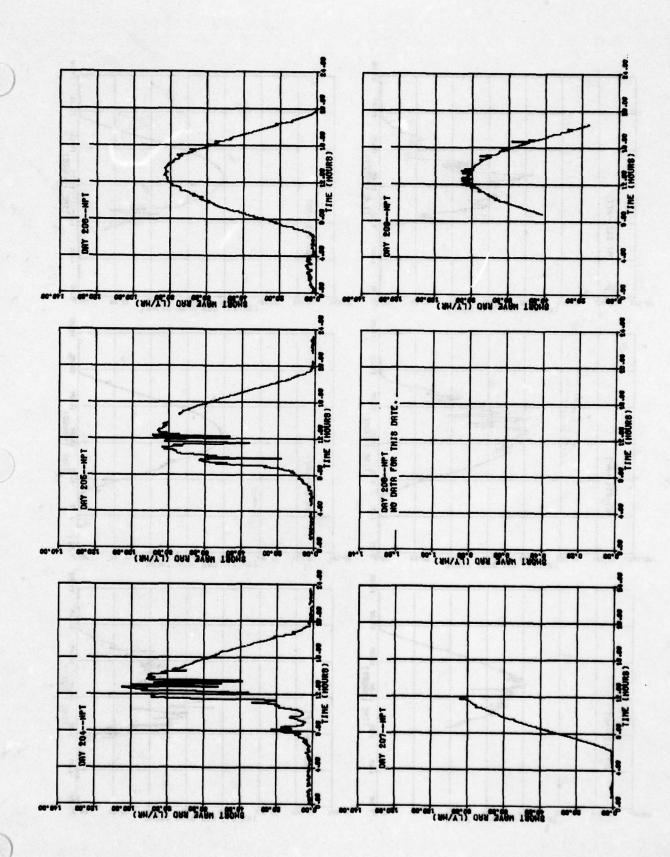


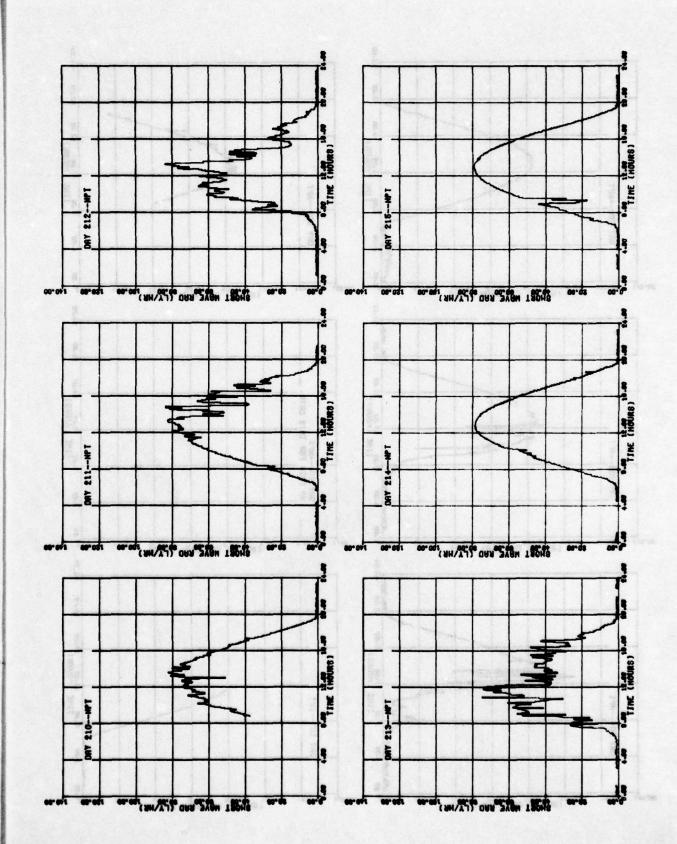


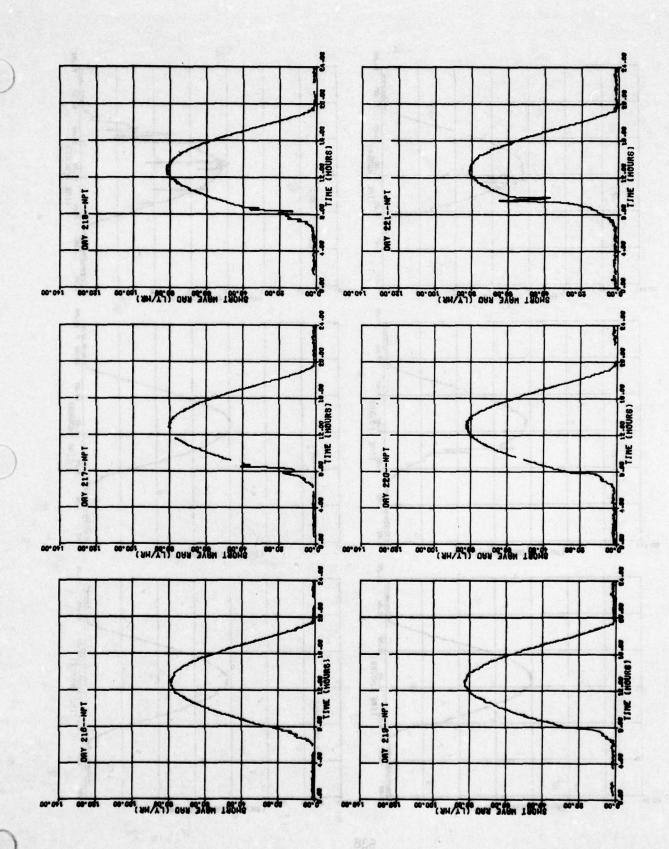


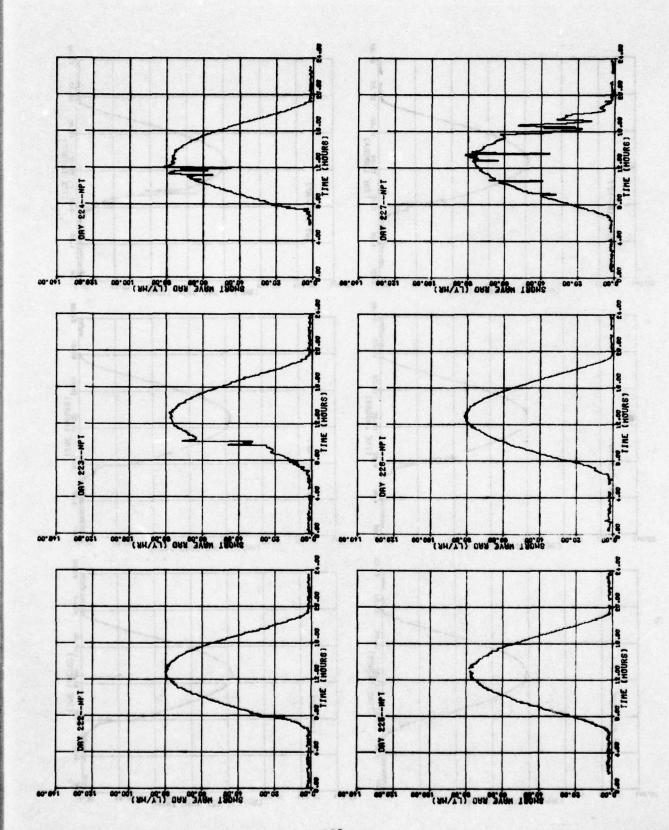


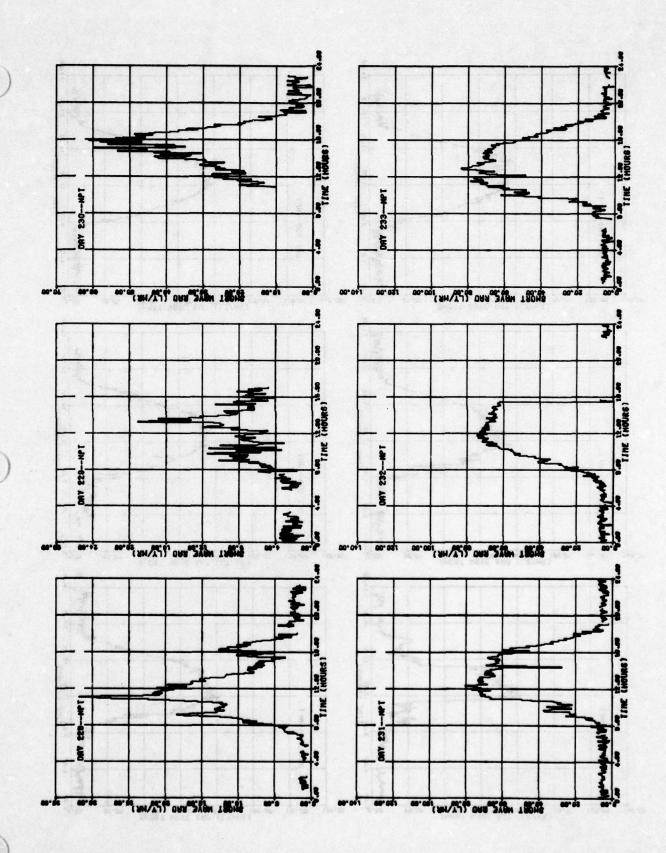


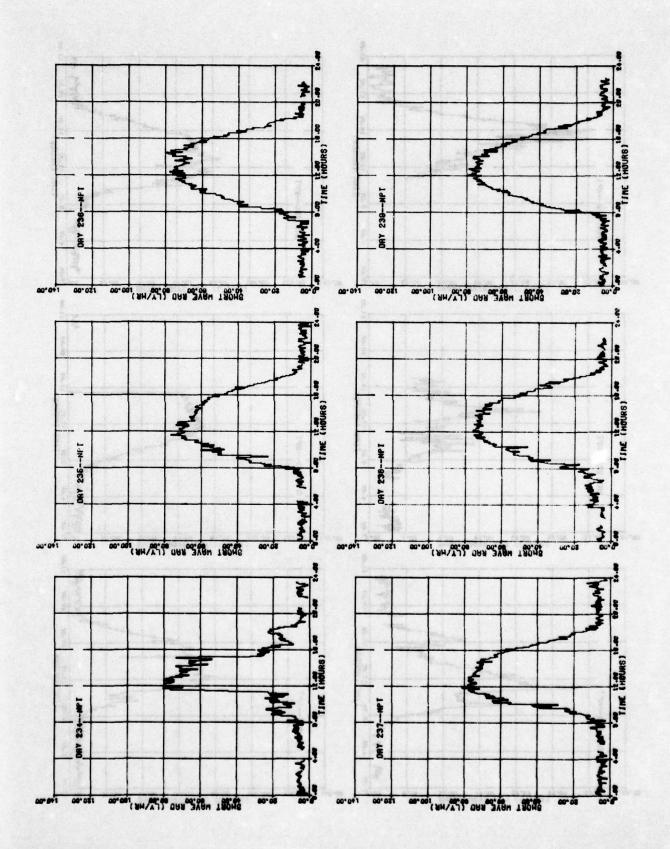


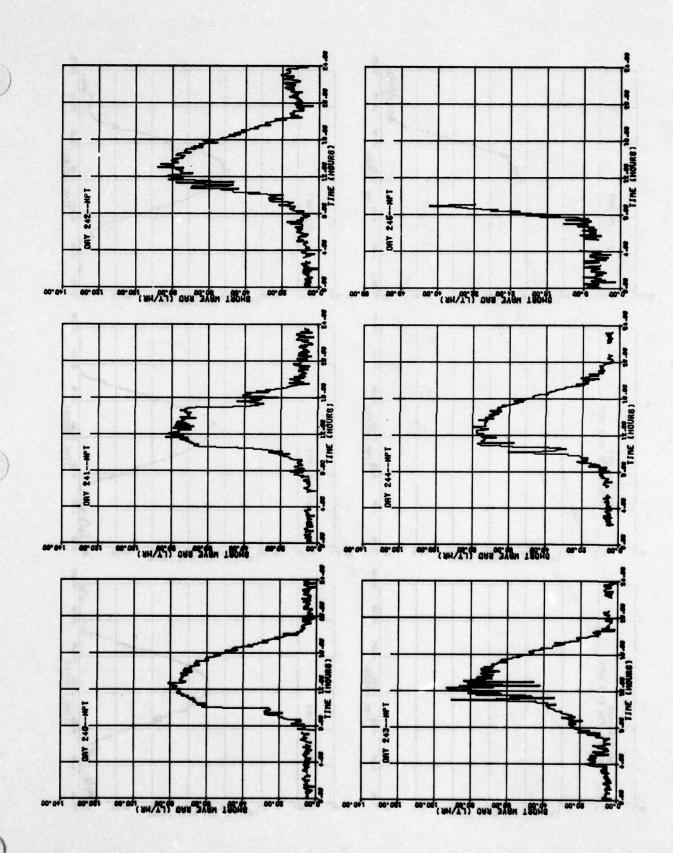


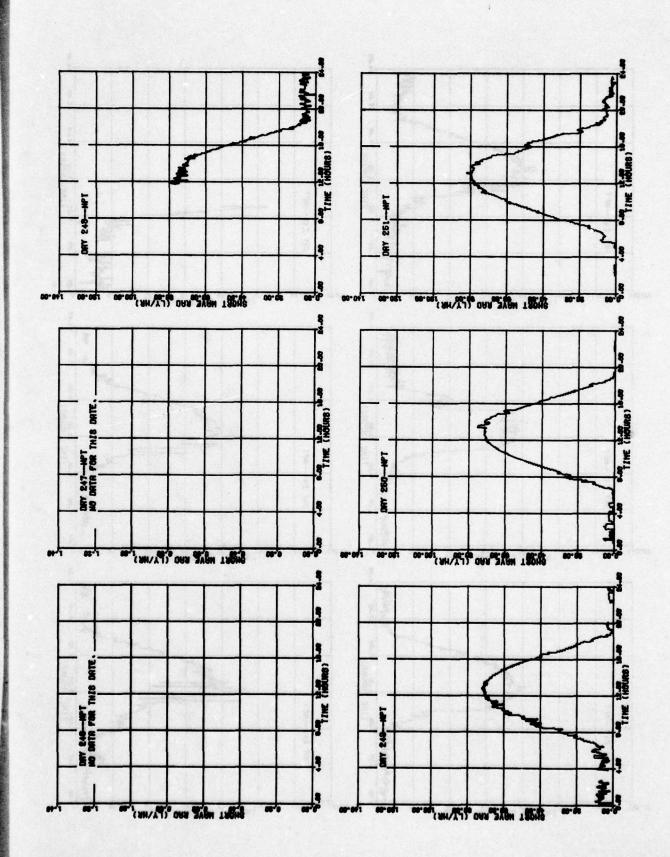


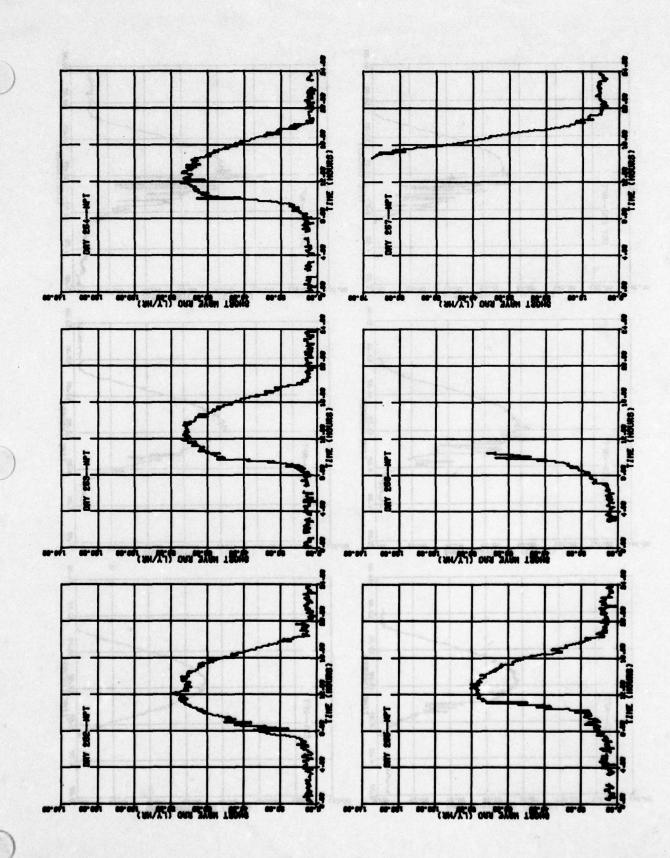


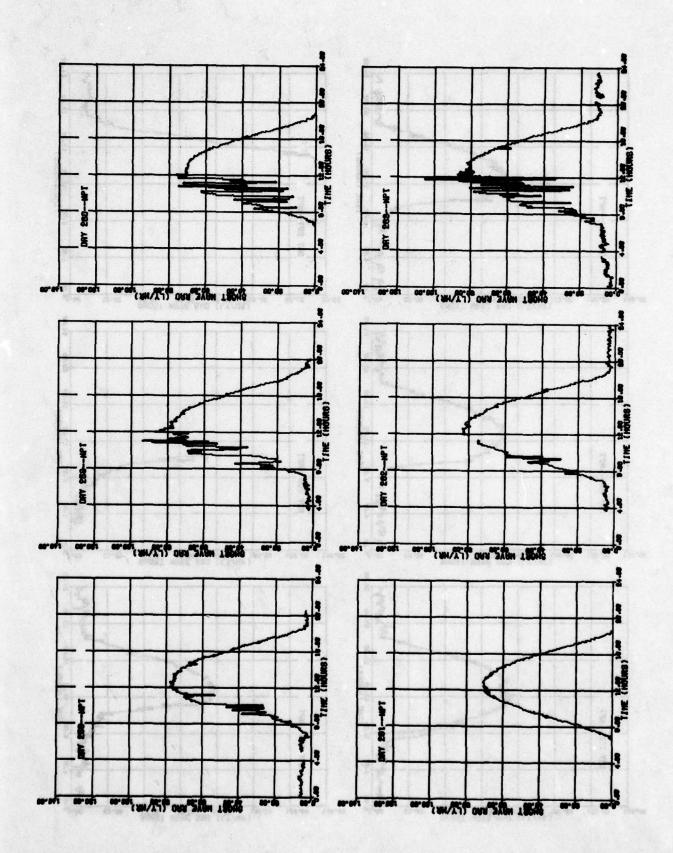


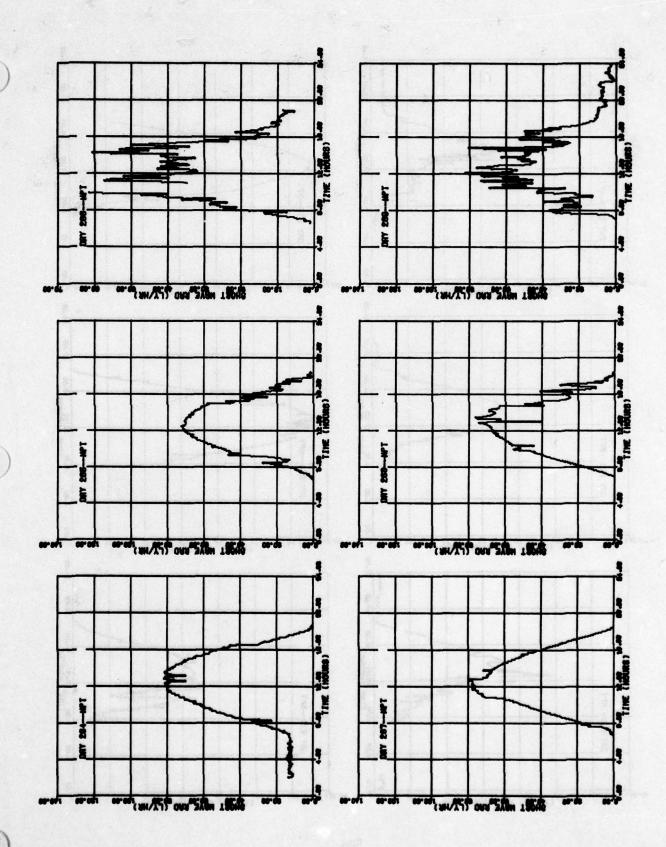


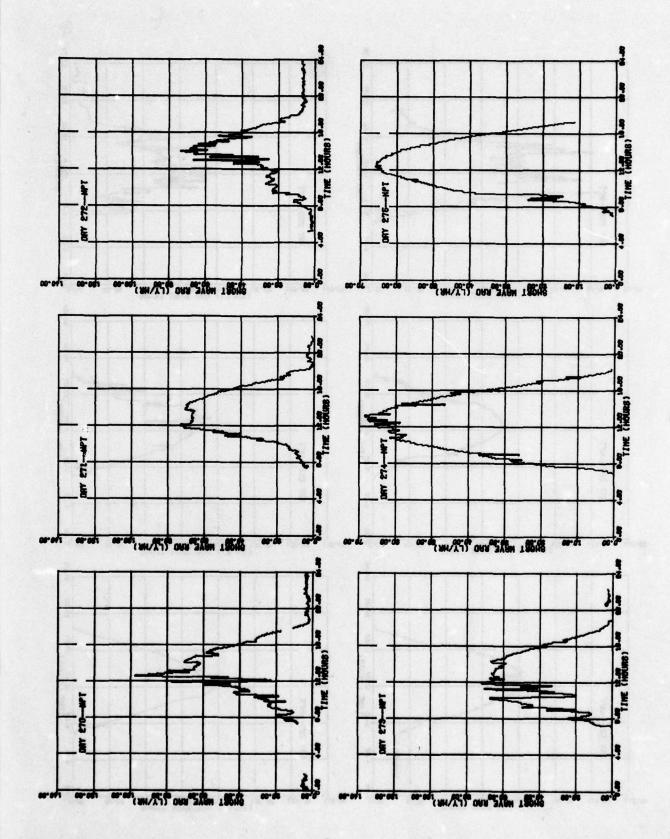


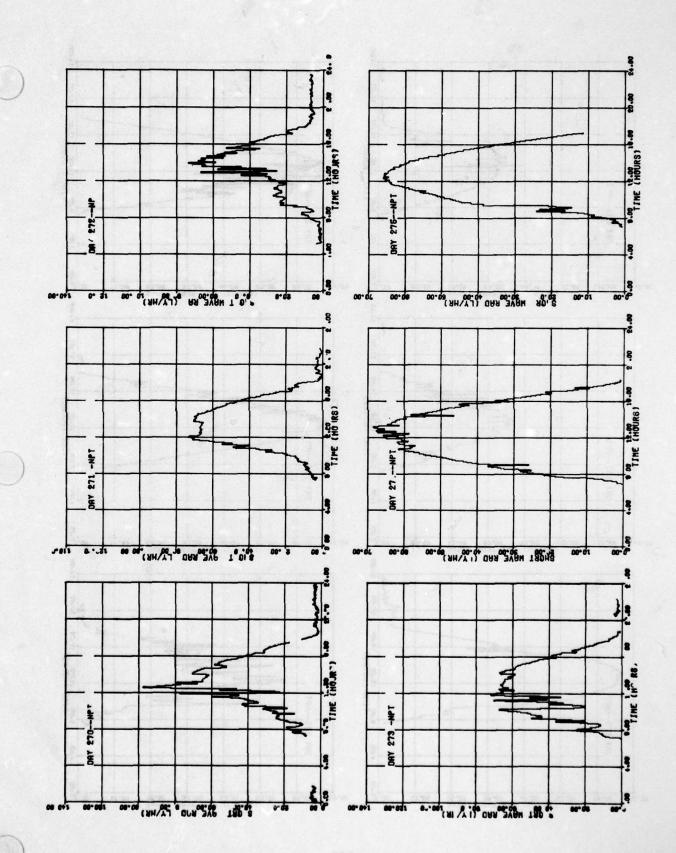


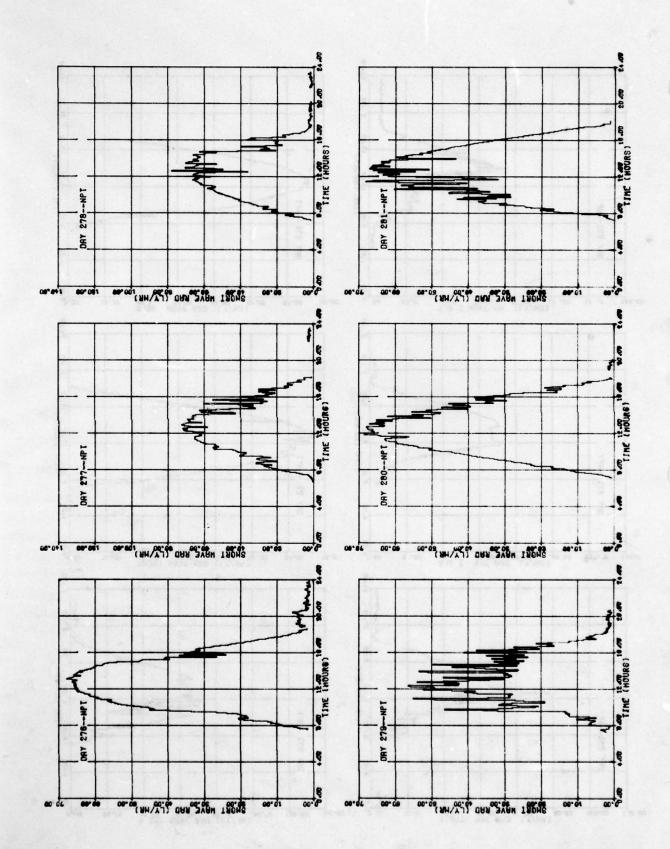


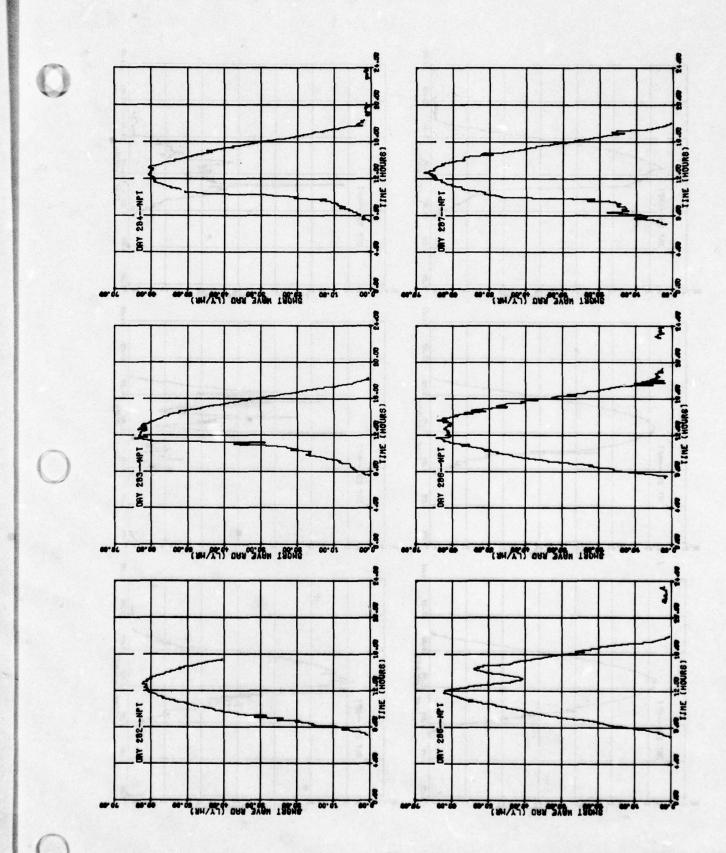


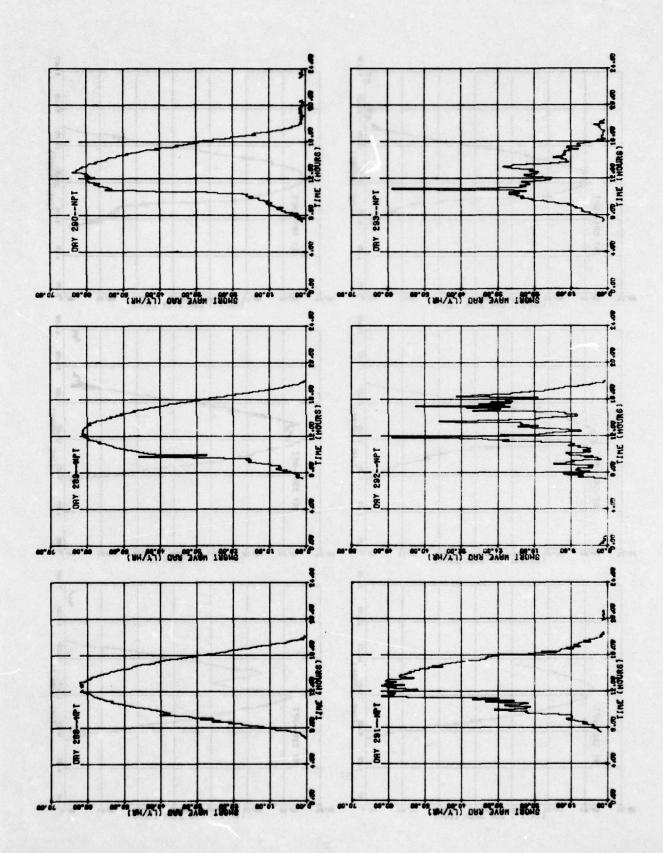


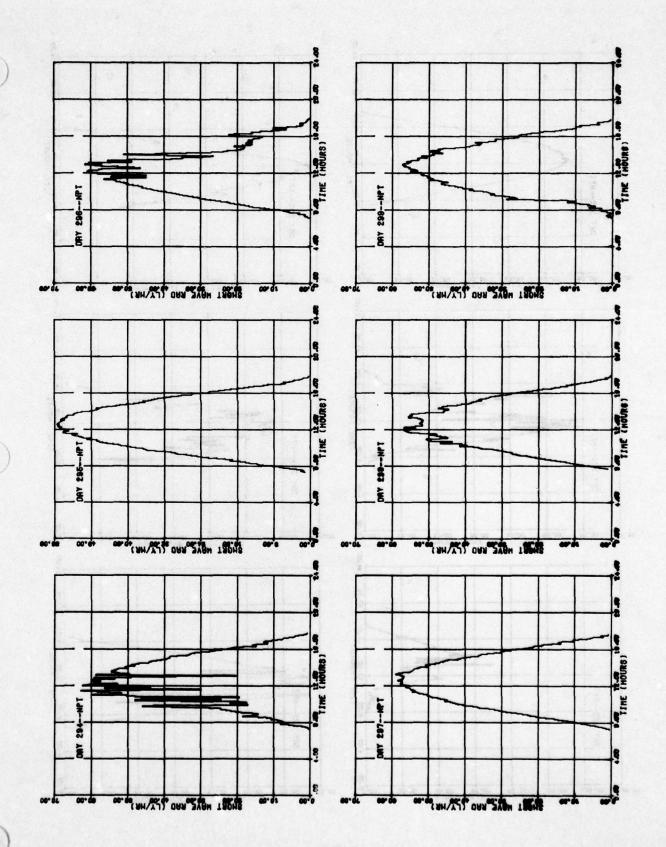


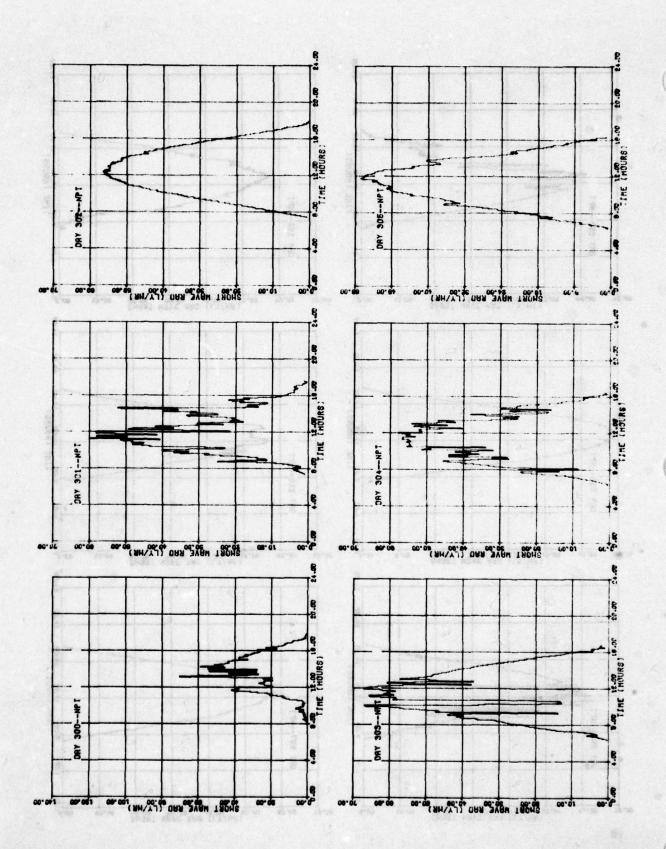


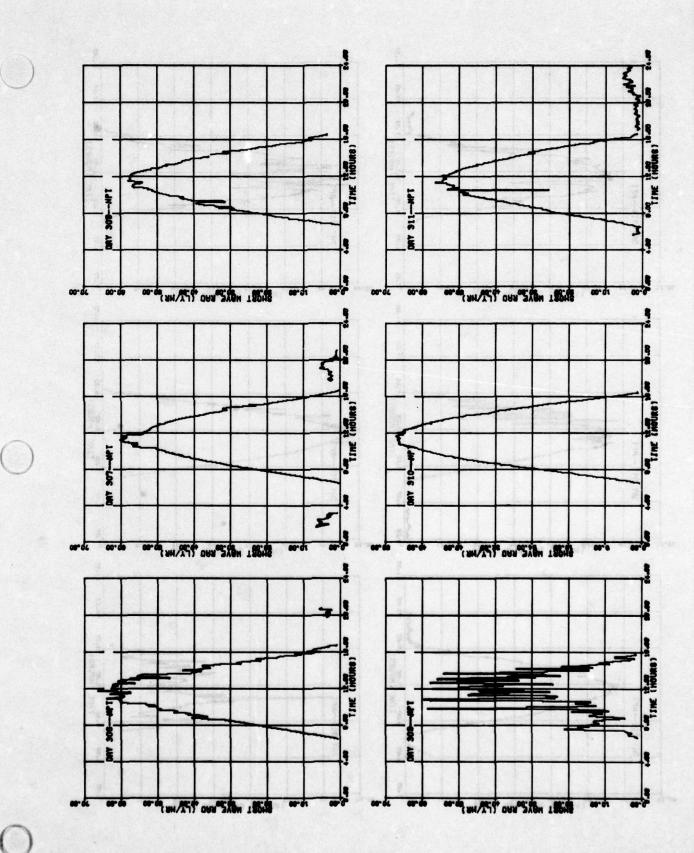


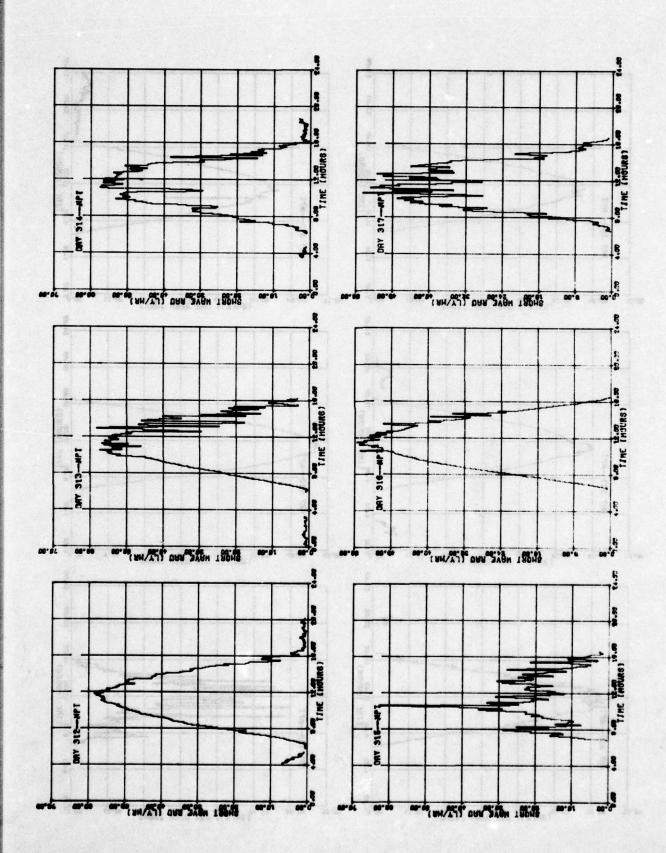


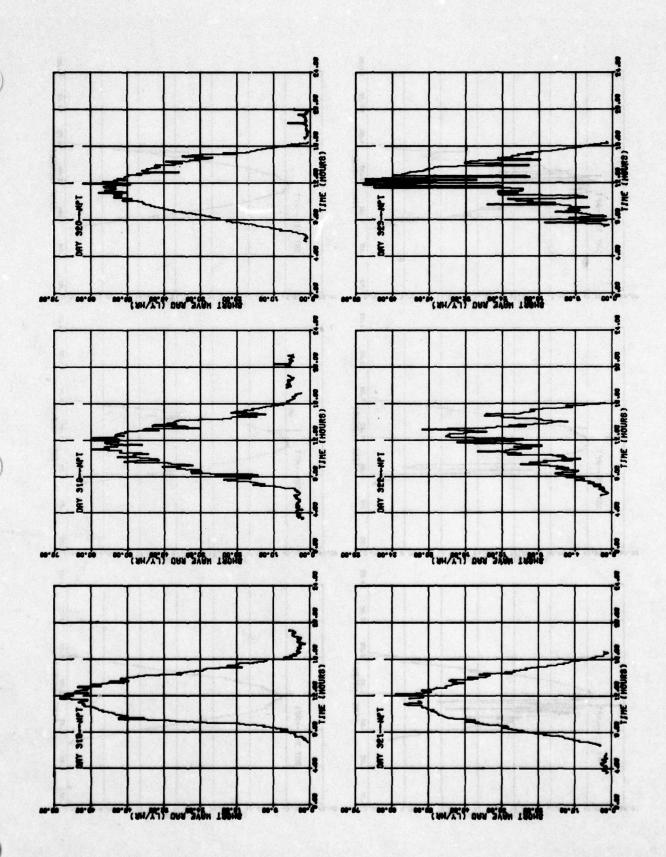


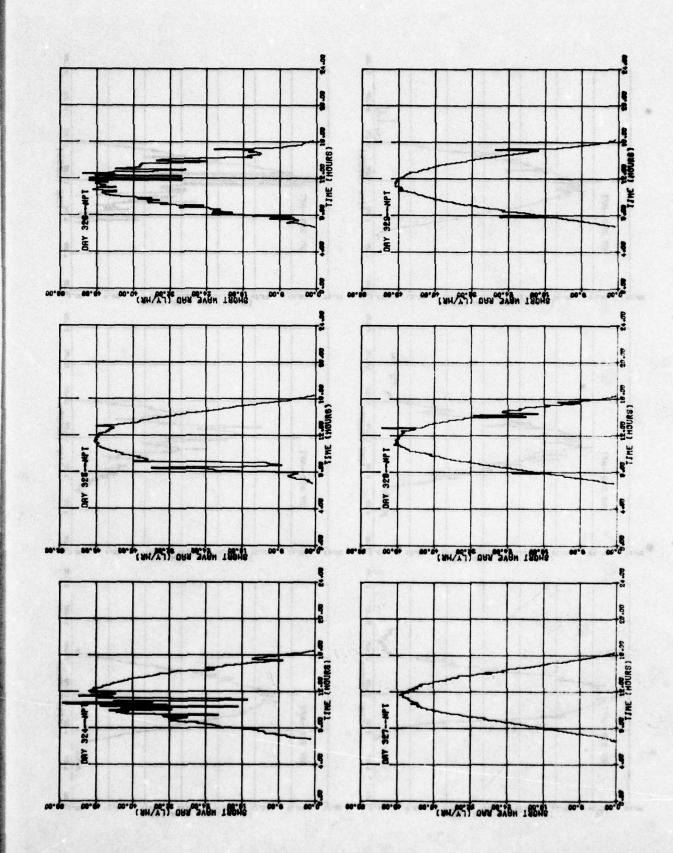


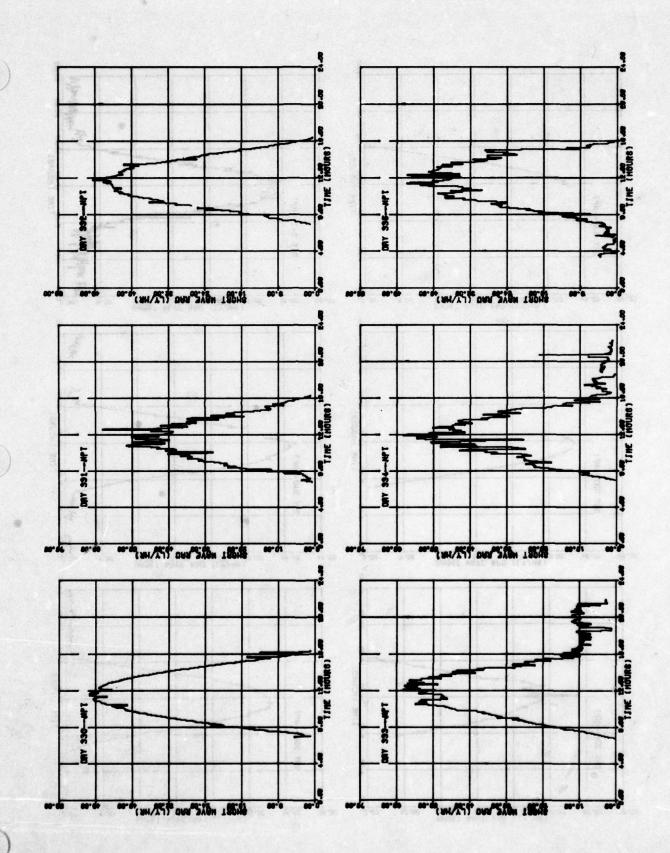


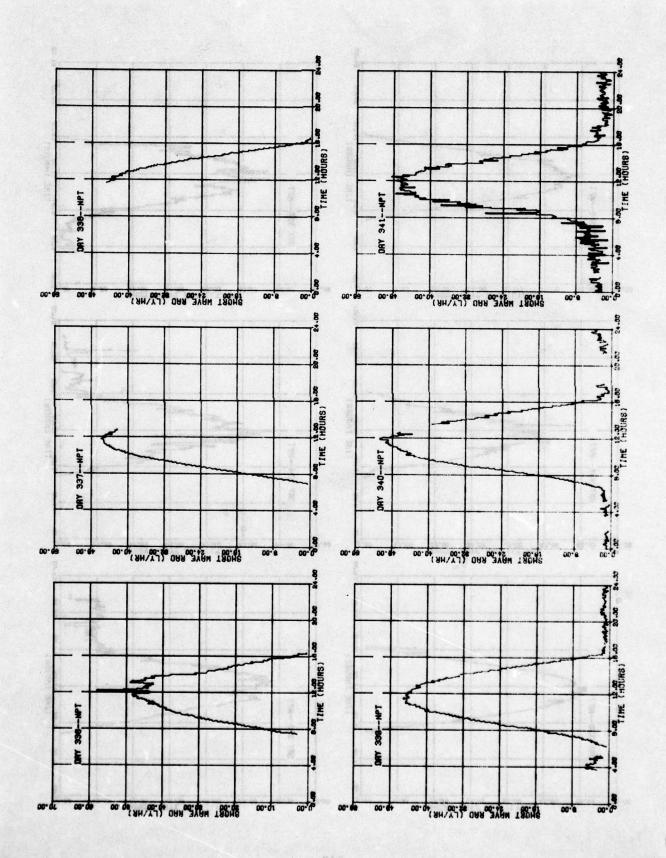


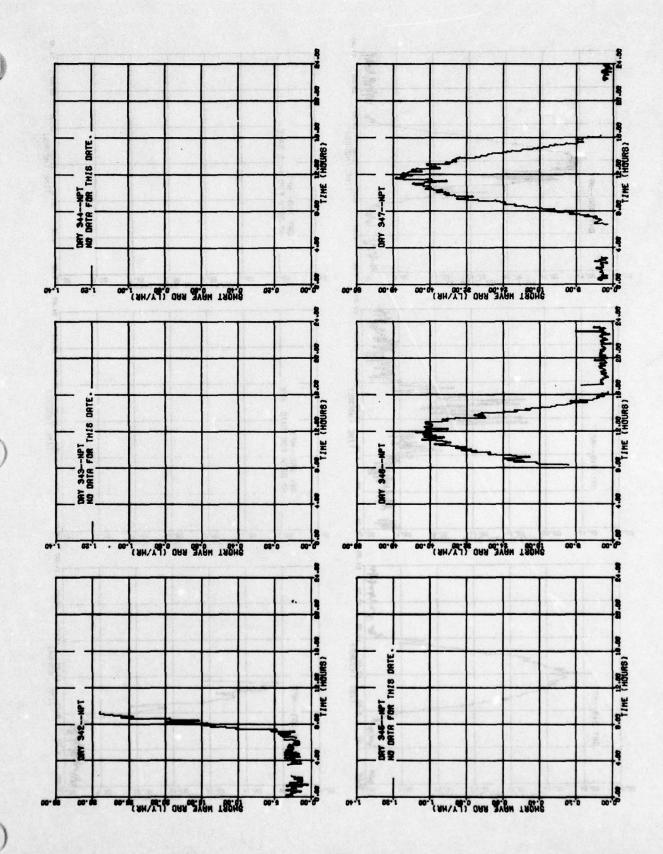


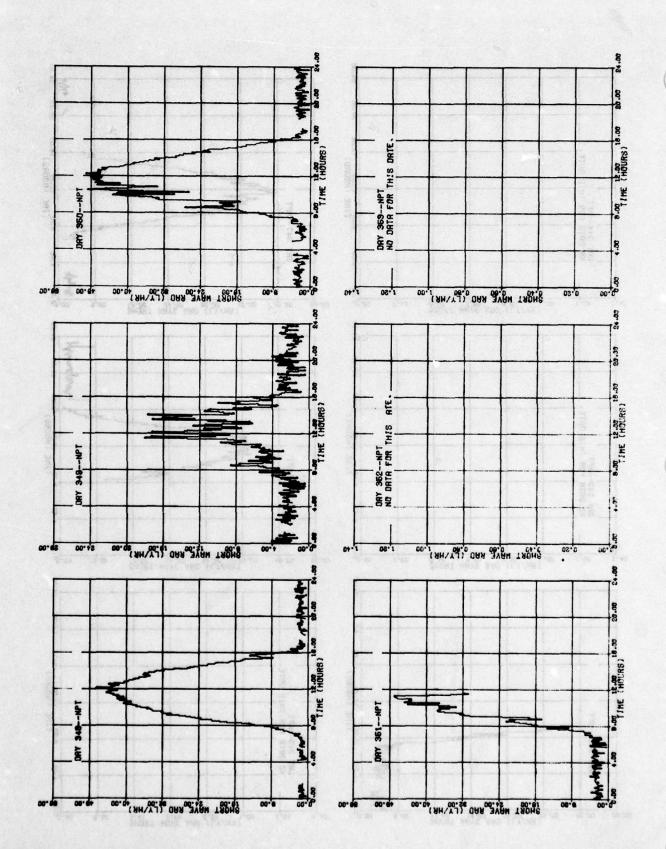












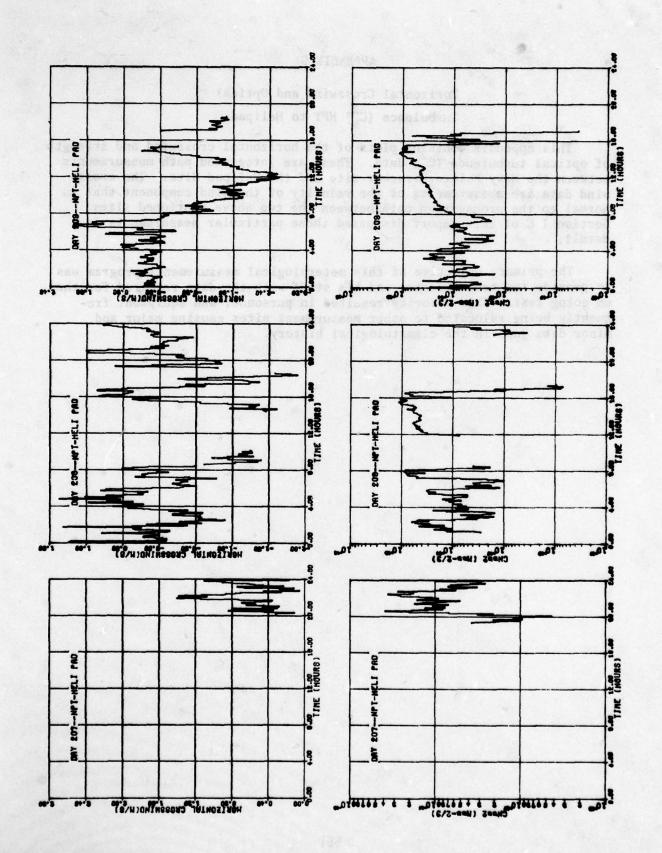
APPENDIX G

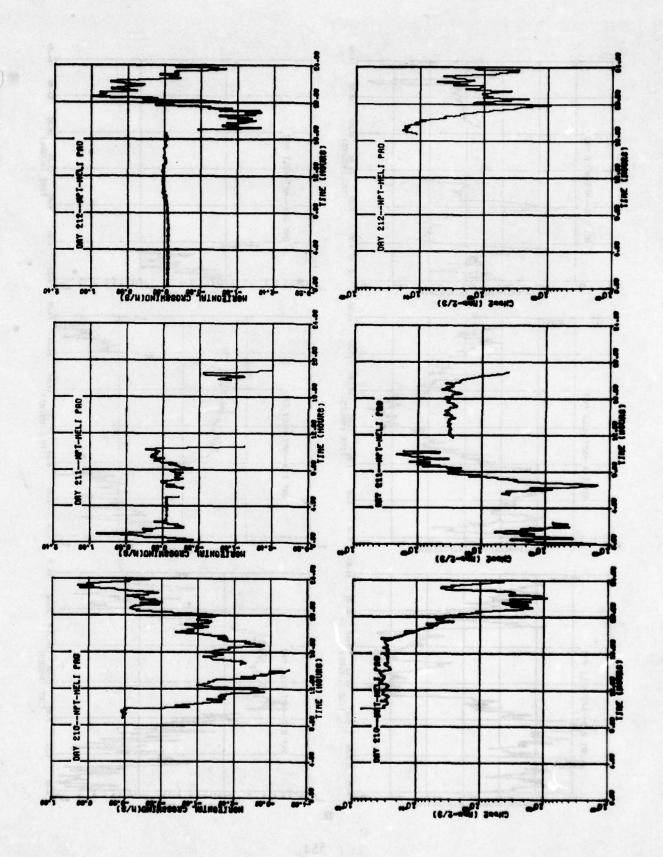
Horizontal Crosswind and Optical Turbulence (C_N^2) NPT to Helipad

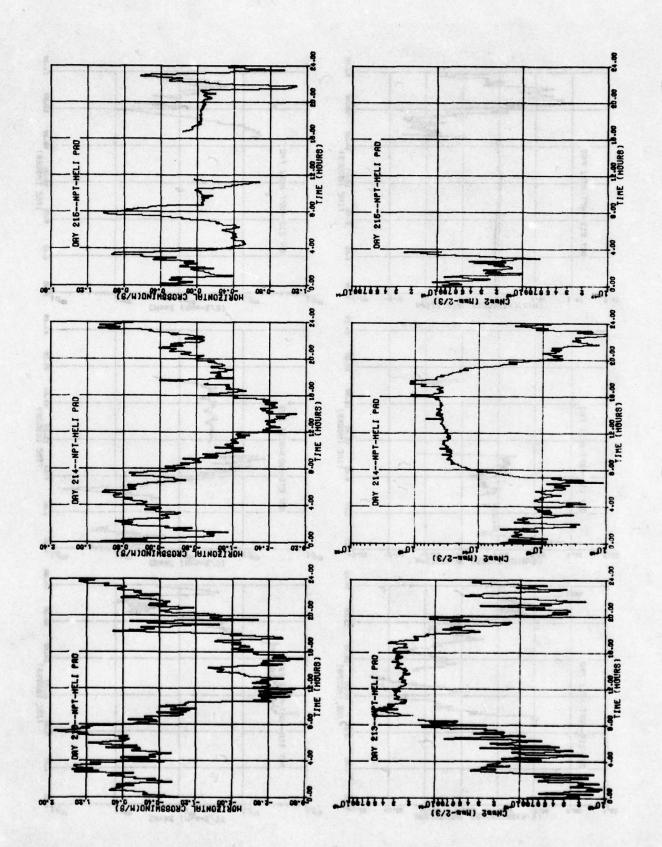
This appendix contains plots of the horizontal crosswind and strength of optical turbulence (C_N^2) data. These are integrated path measurements between the Navy Pointer-Tracker site and the Helipad Site. The crosswind data are measurements of the velocity of the wind component that is normal to the propagation path between the two above mentioned sites. Section I C of this report discussed these particular measurements in detail.

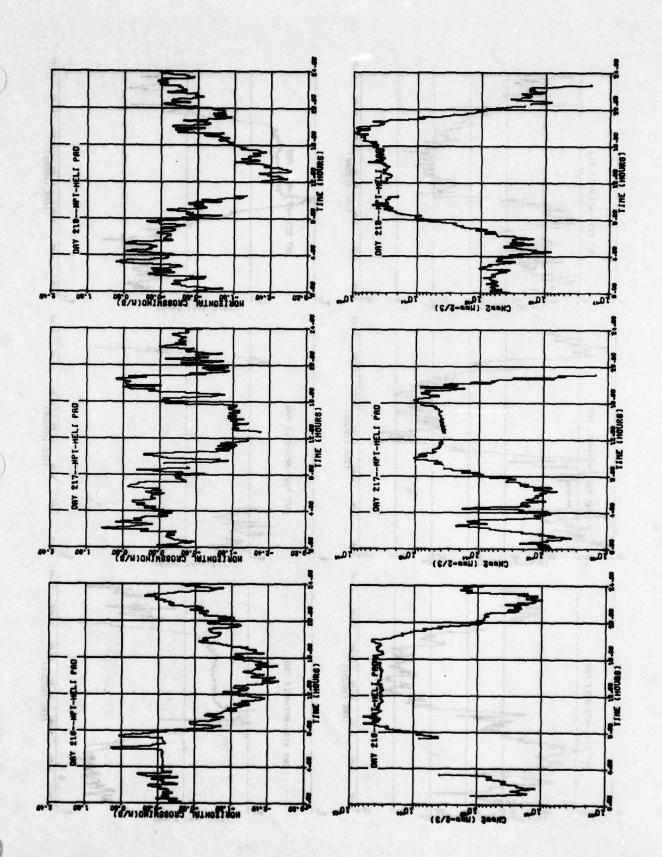
The primary objective of this meterological measurements program was to provide the test director and his staff with the data required for the on going test. This priority resulted in personnel and equipment frequently being relocated to other measurement sites causing major and minor data gaps in the climatological history.

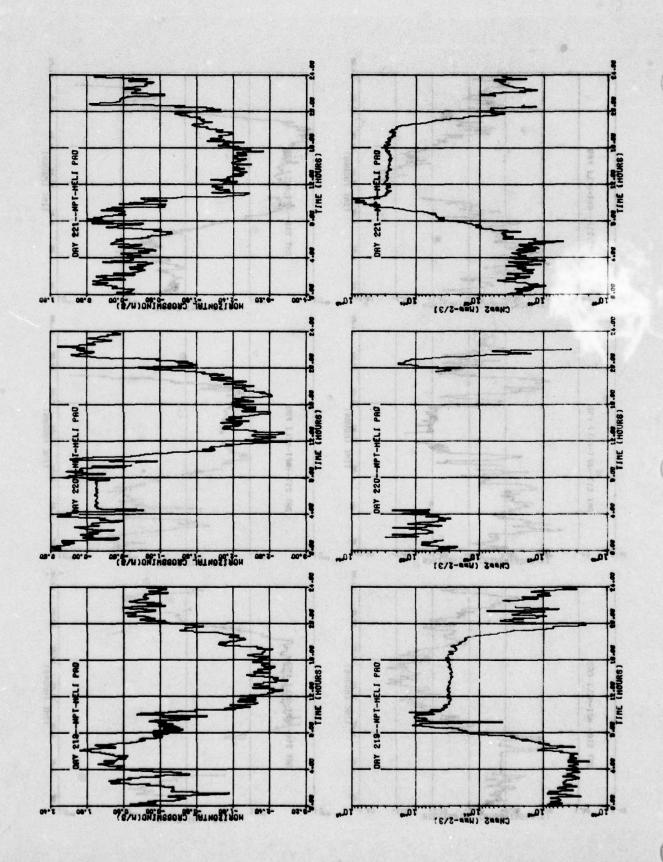
E & A KOLONIA, E & ACKNOWN E & TEATHER

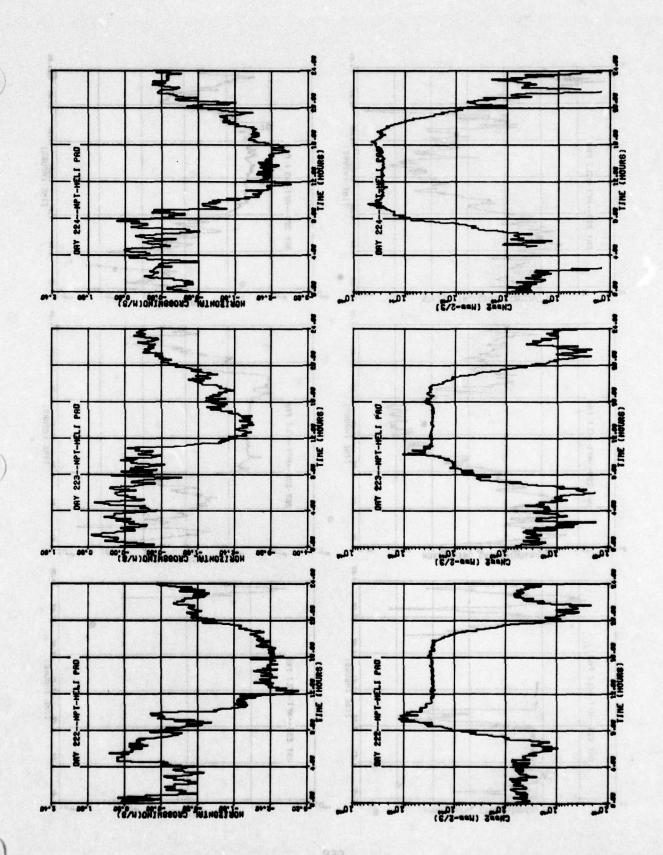


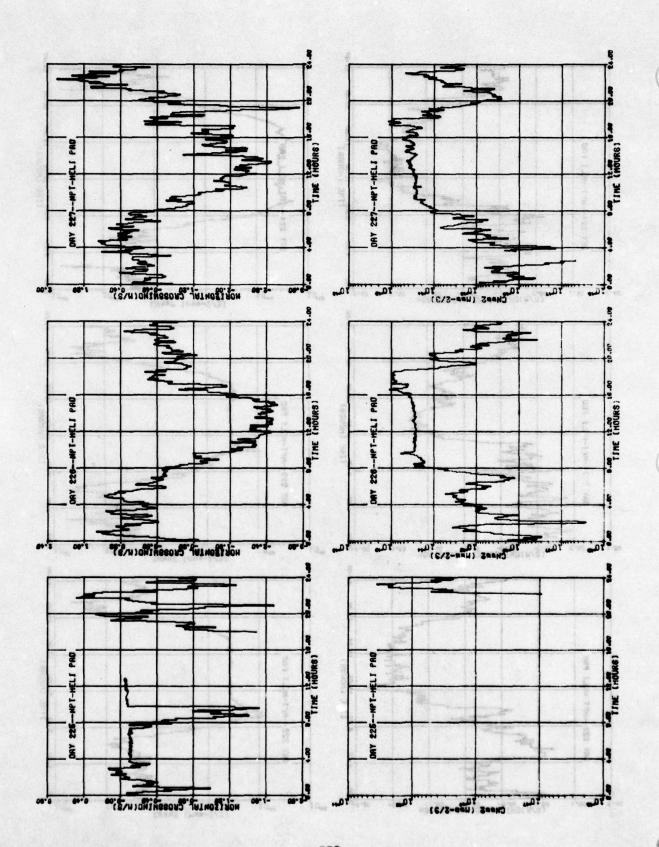


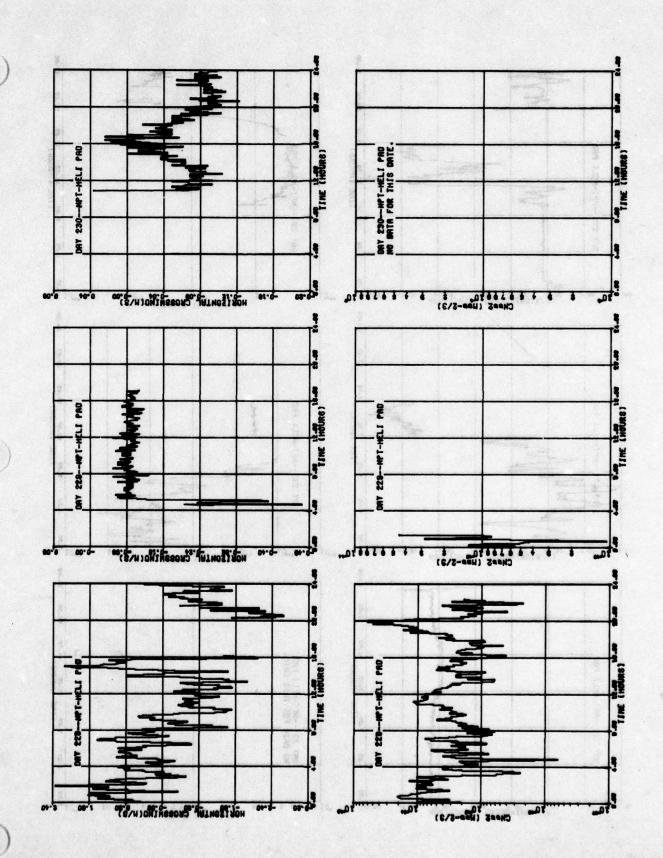


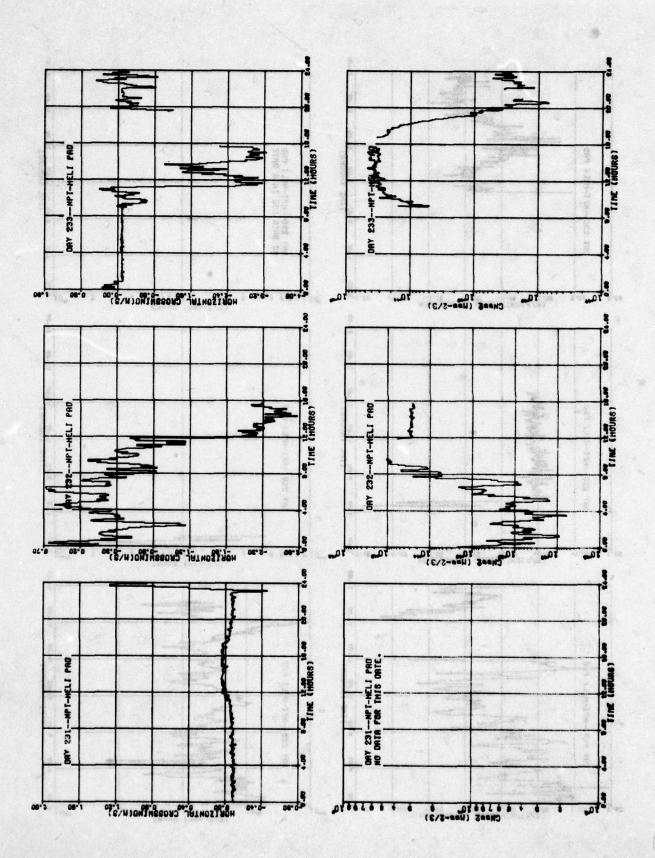


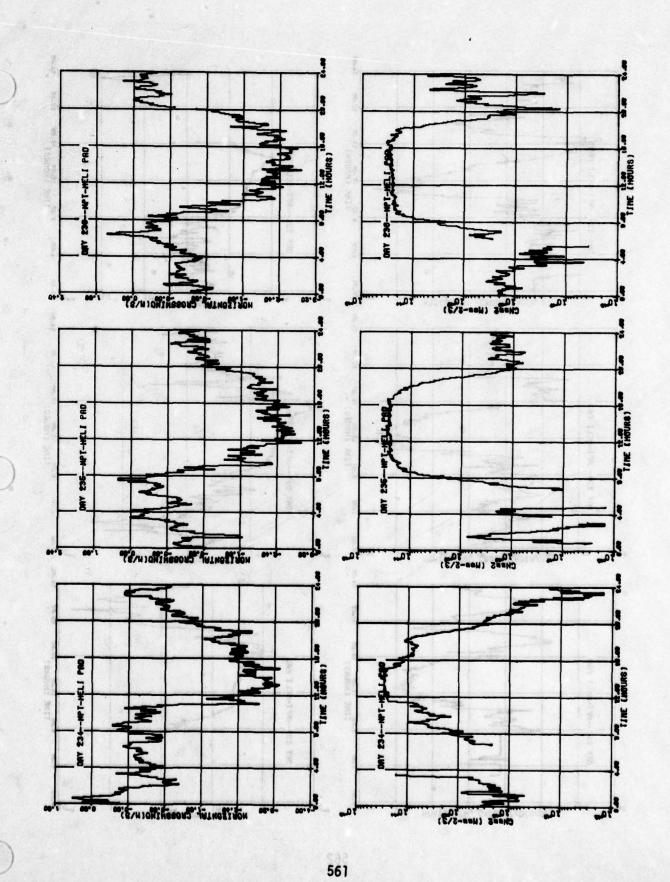


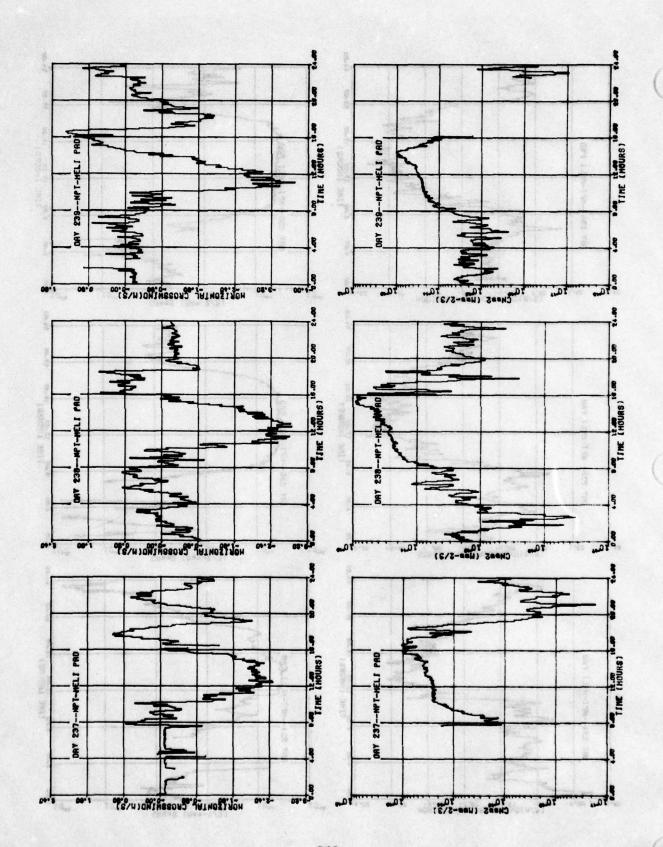


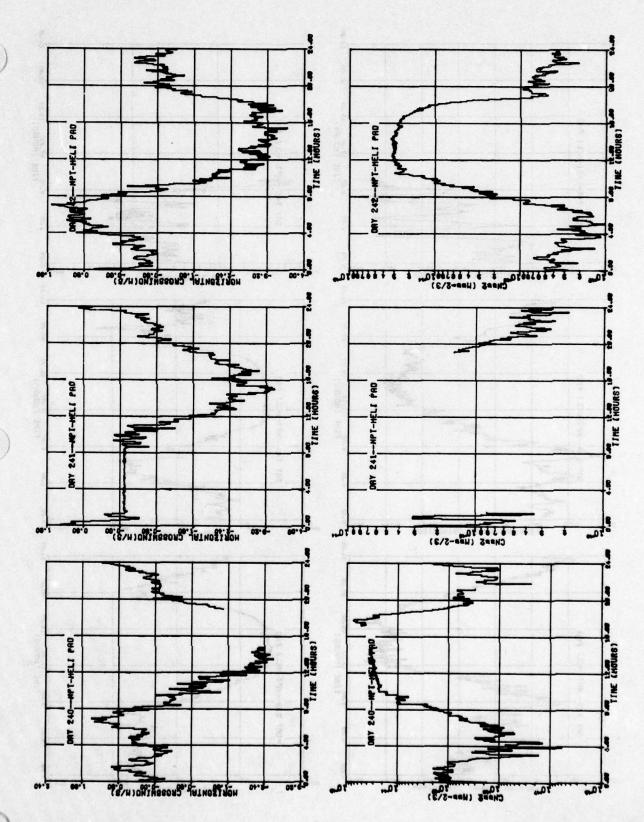


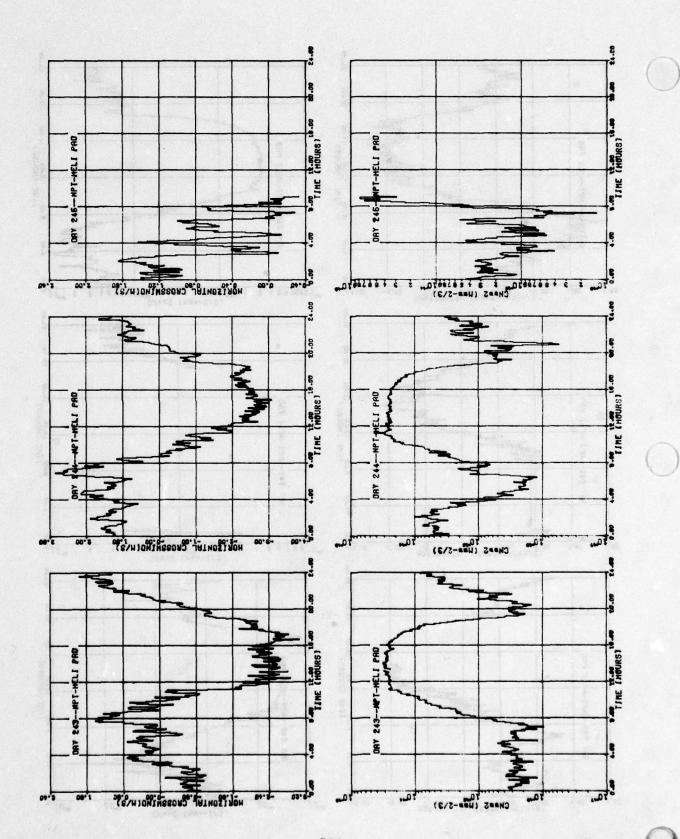


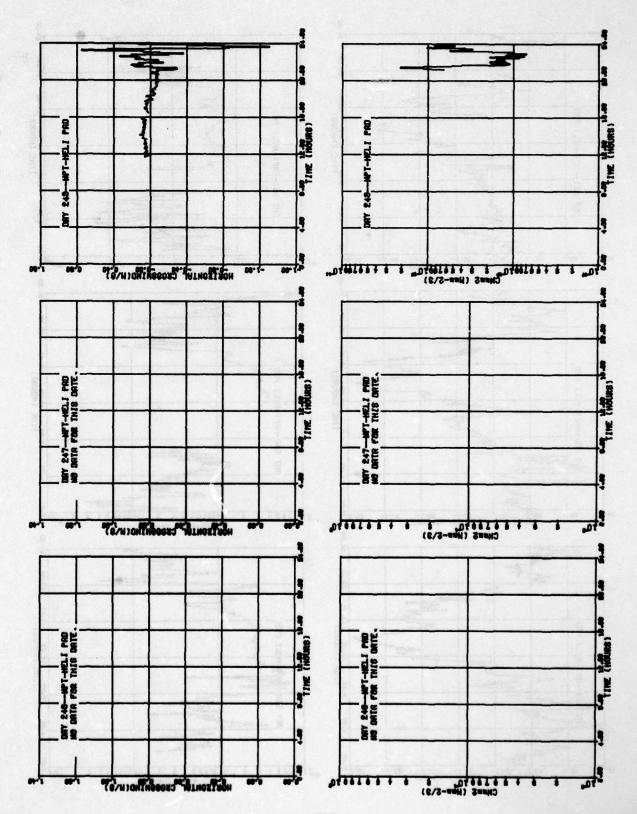


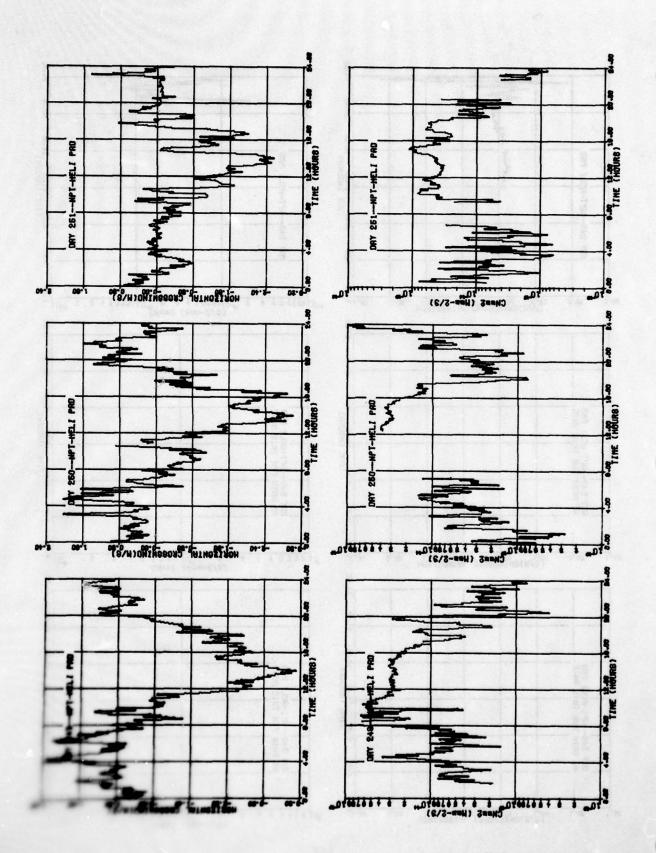


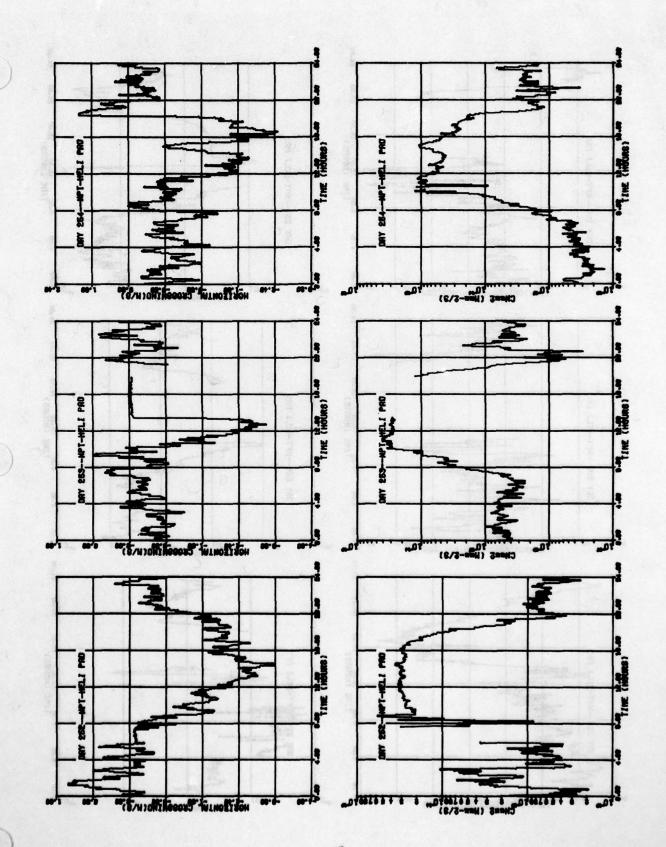


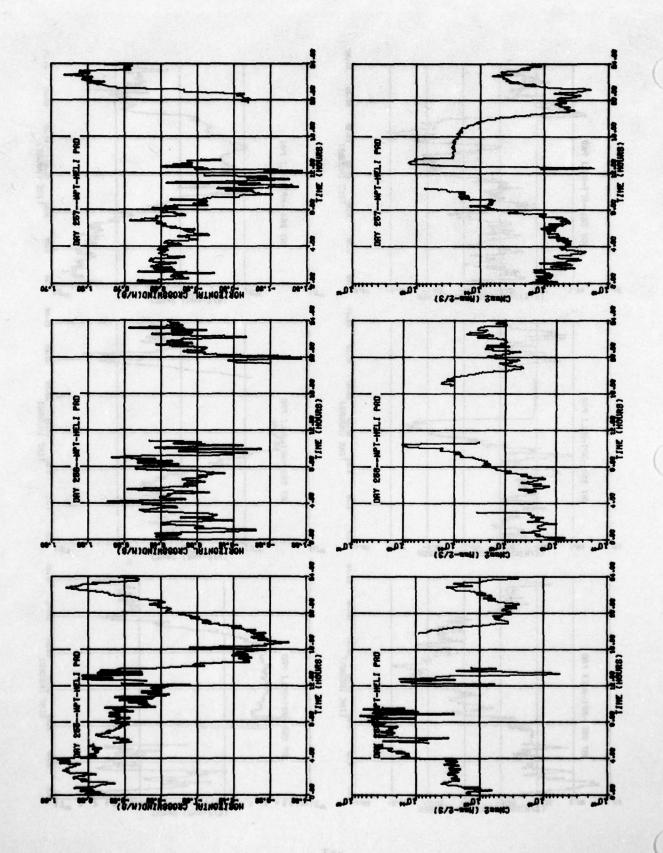


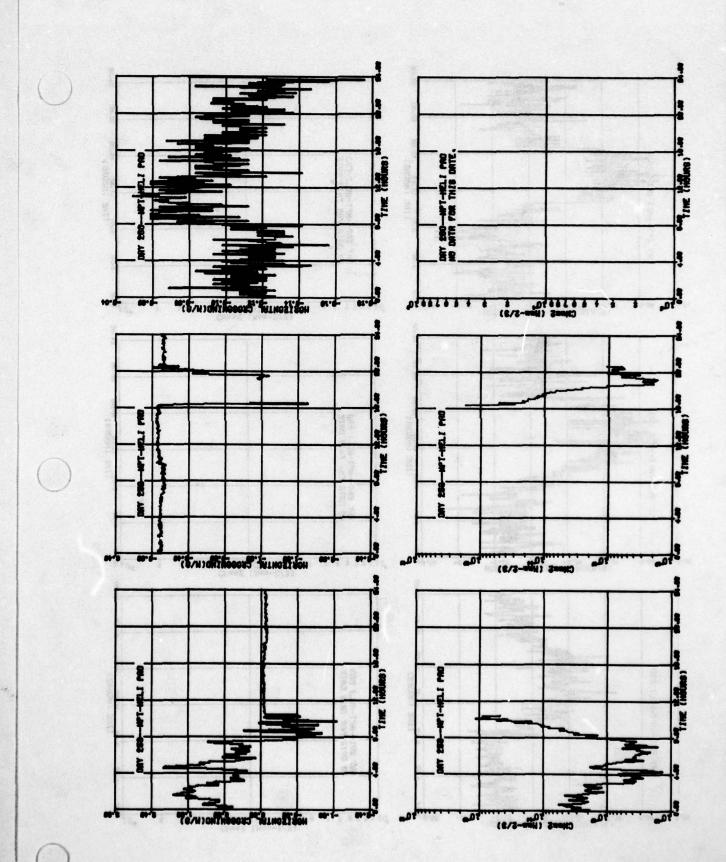


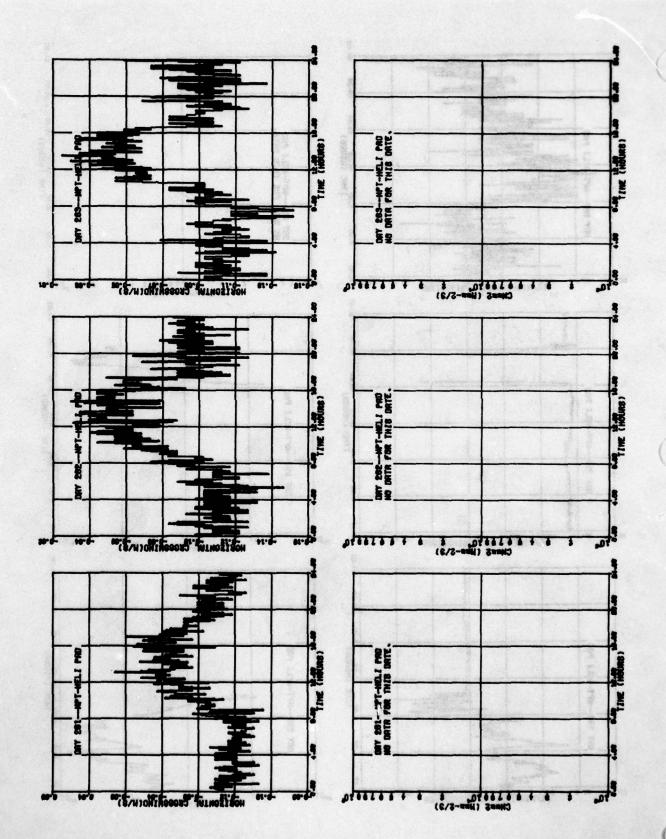


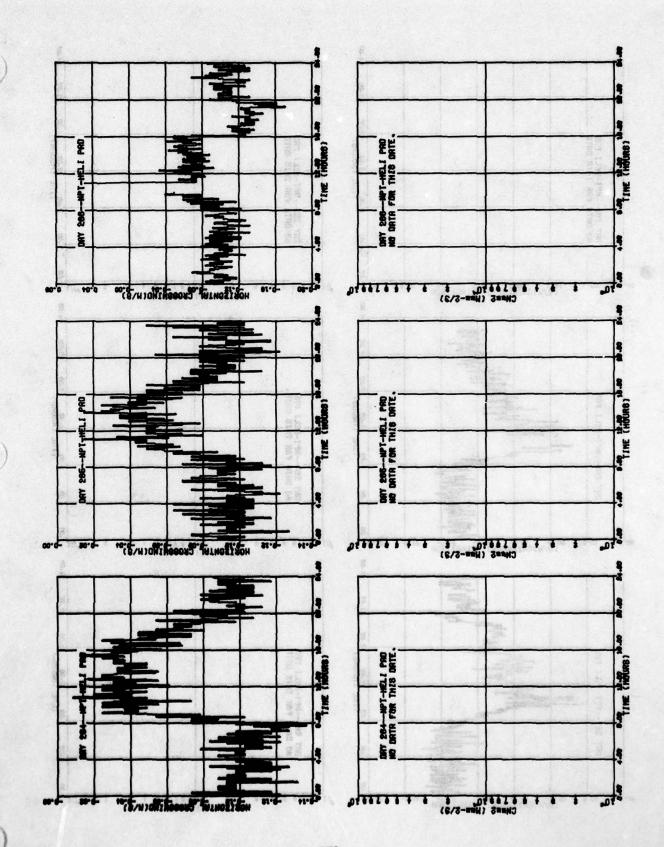


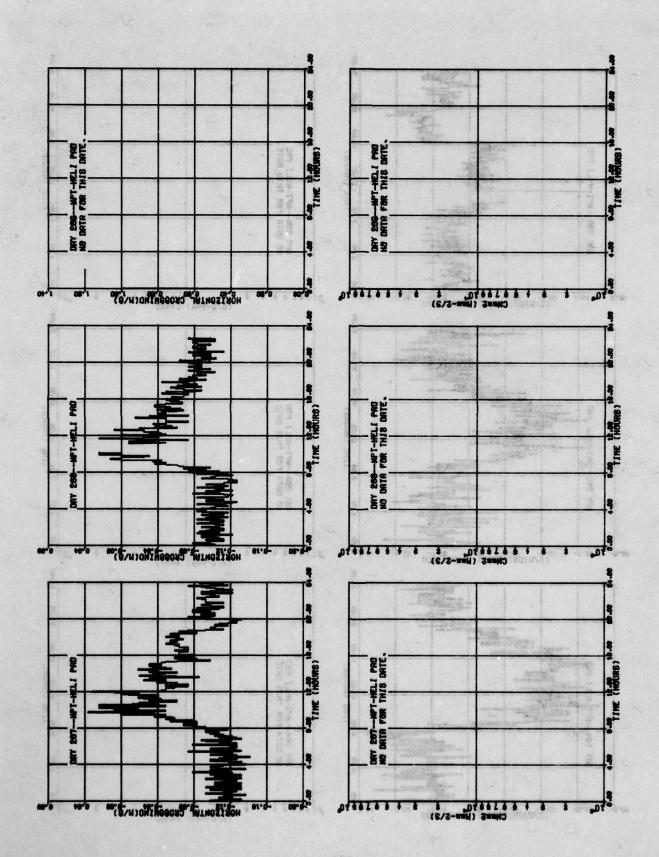


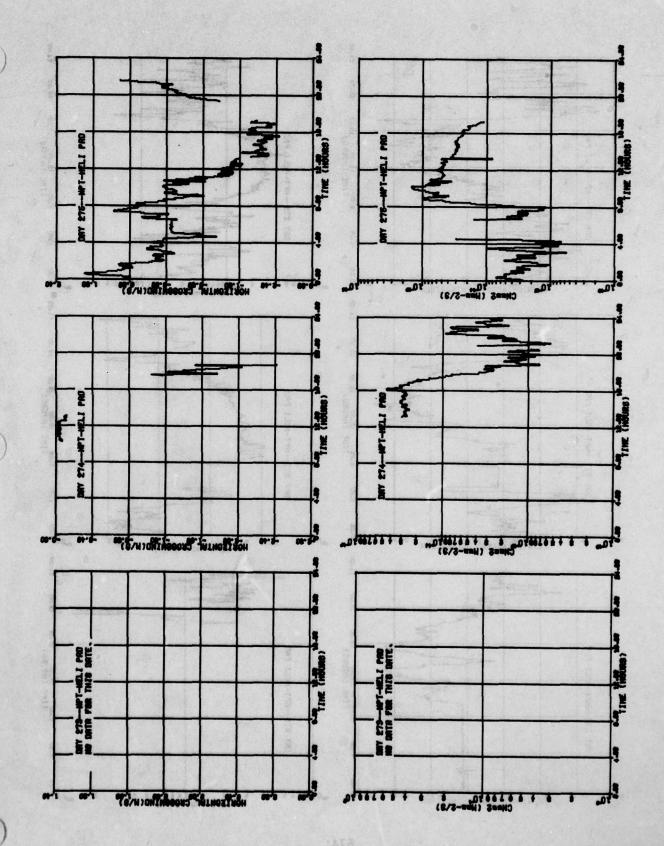


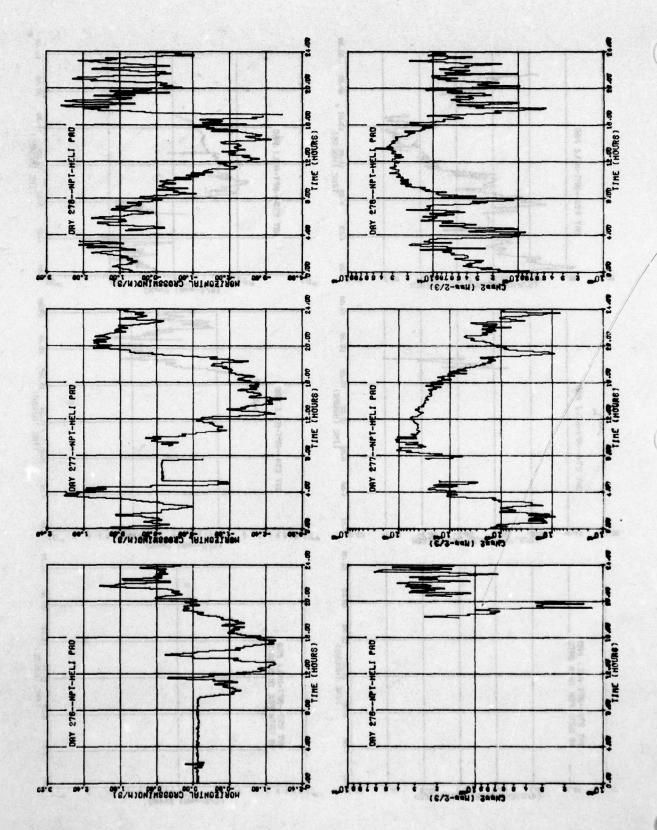


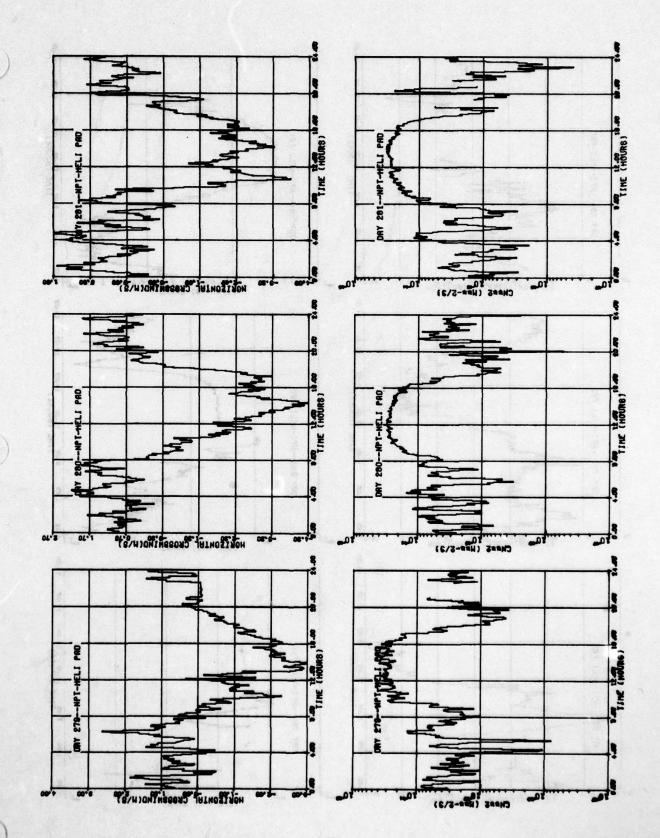


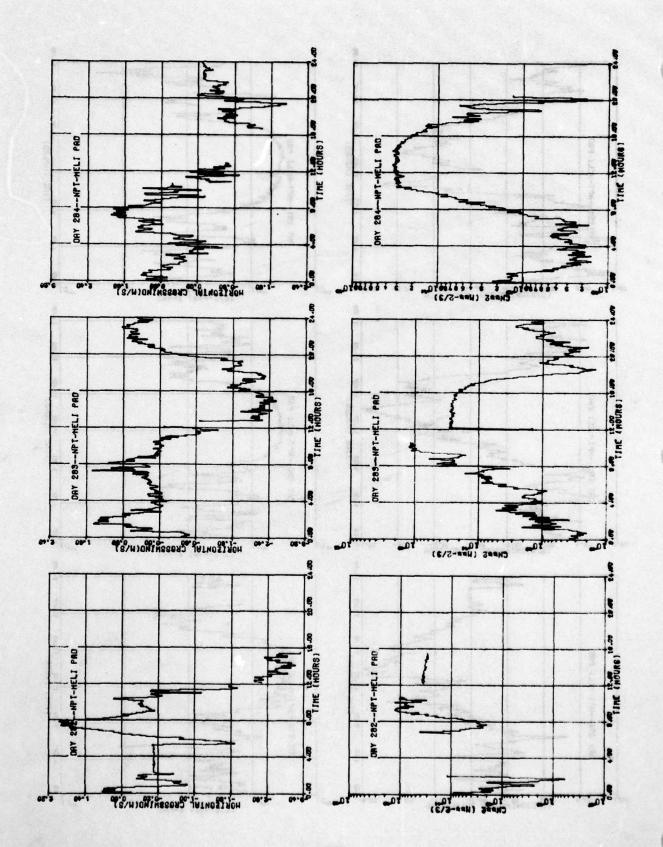


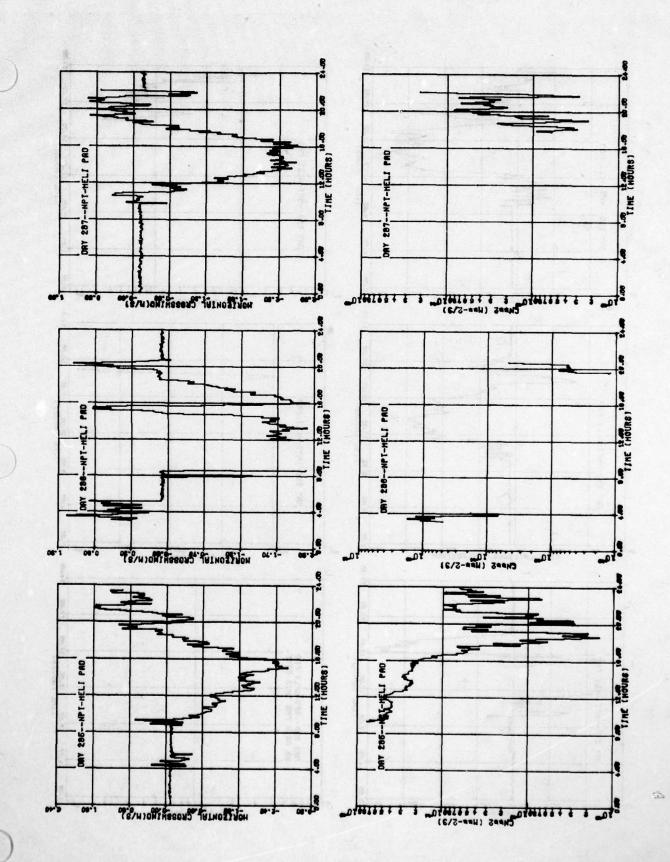


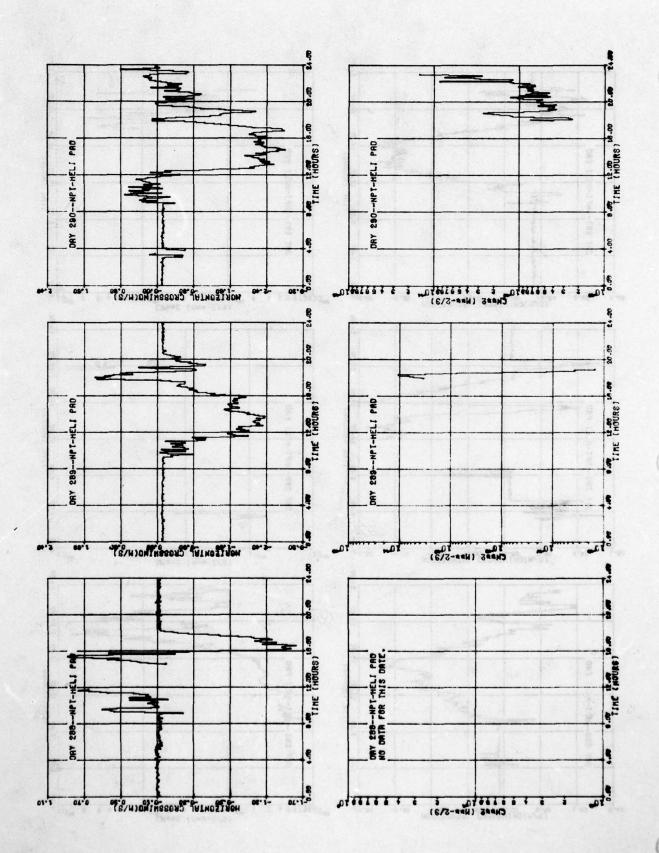


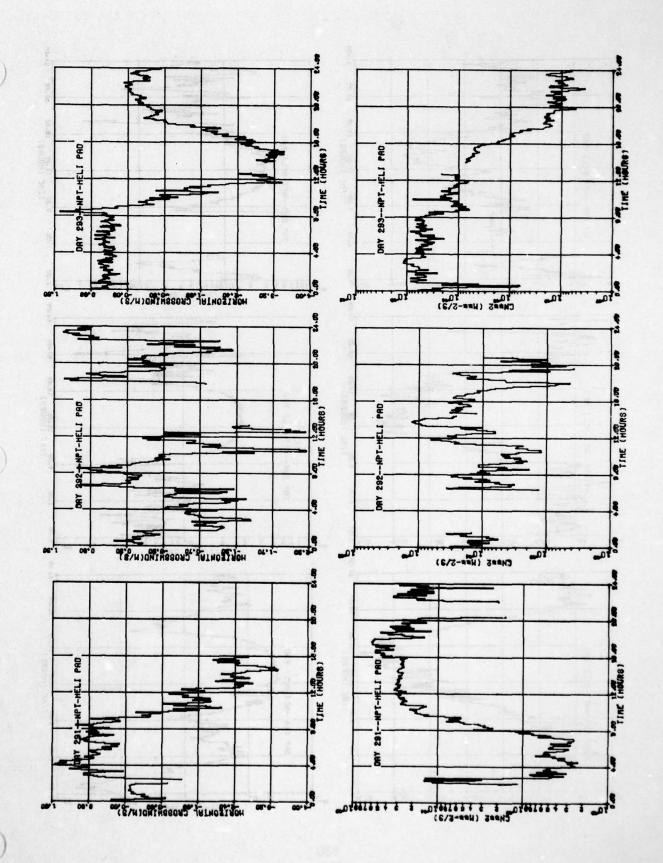




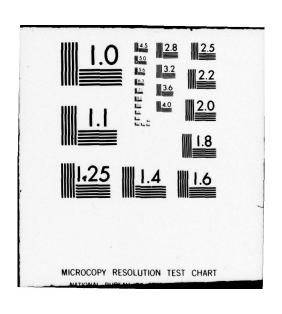


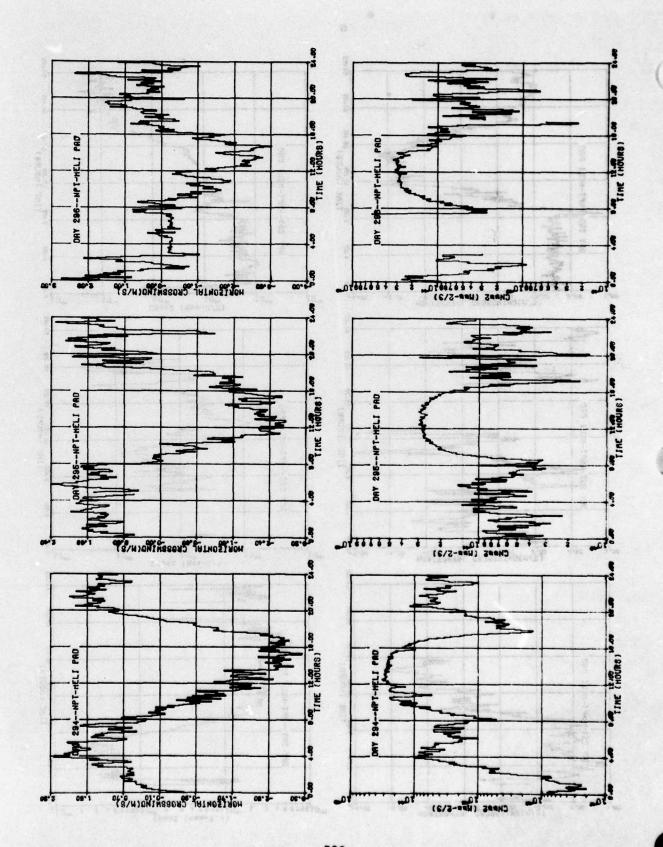


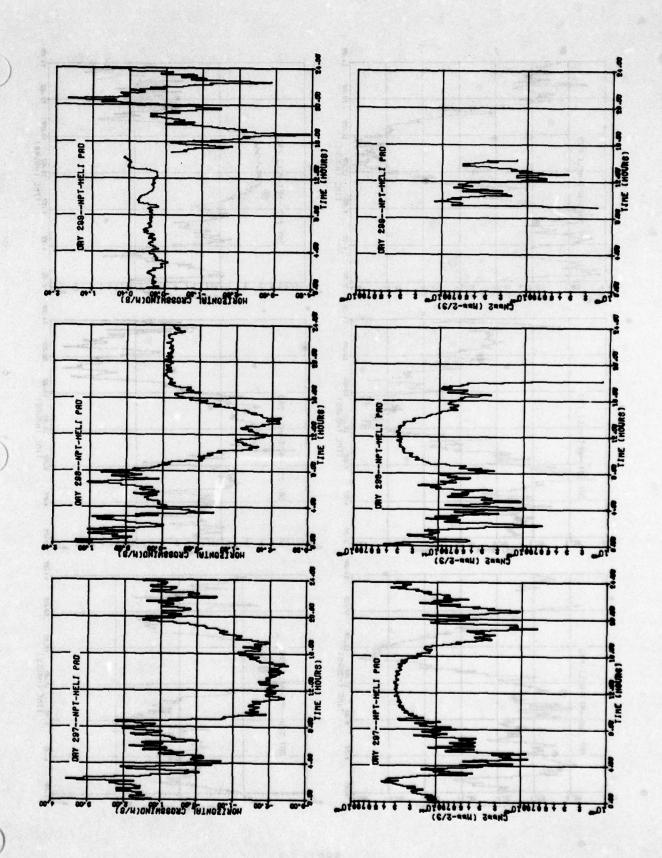


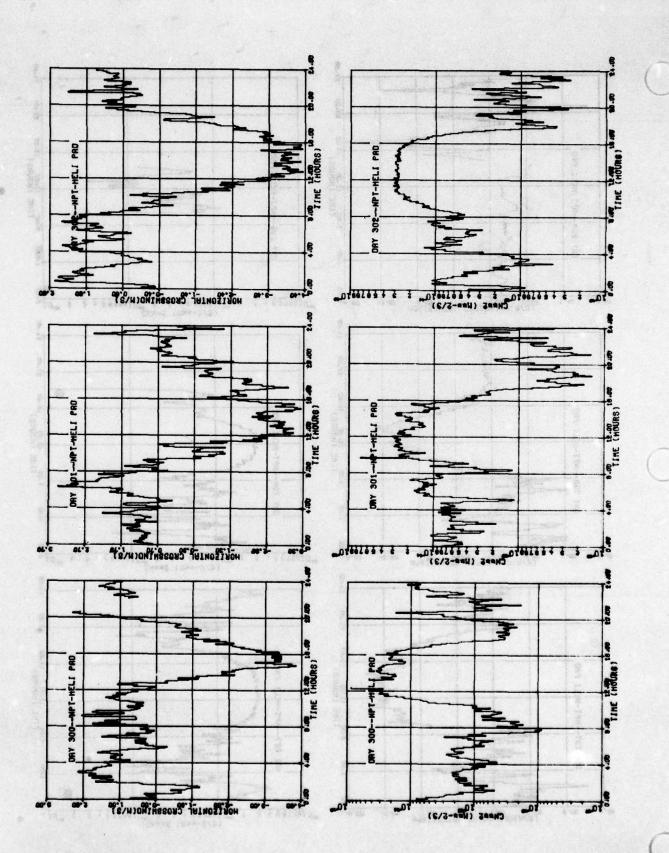


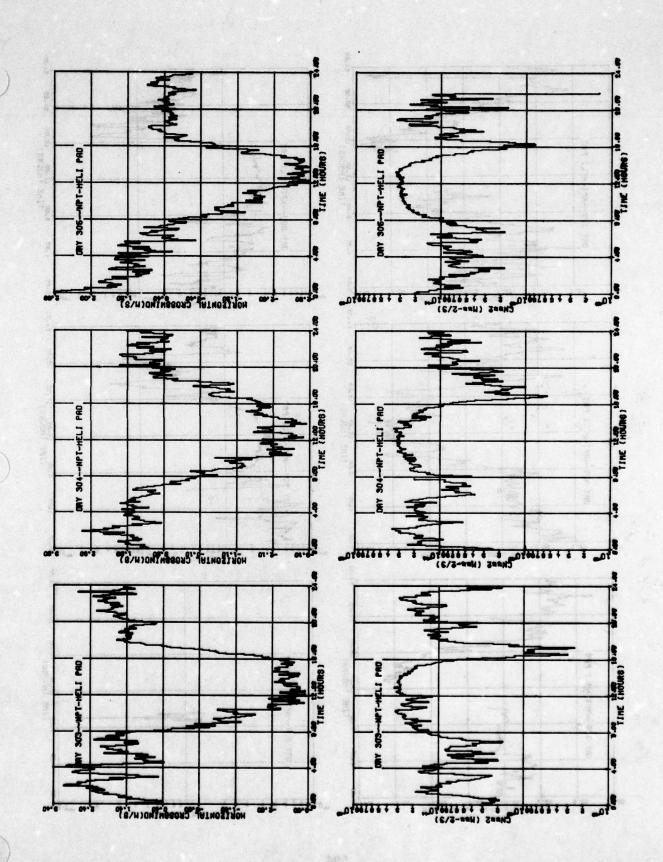
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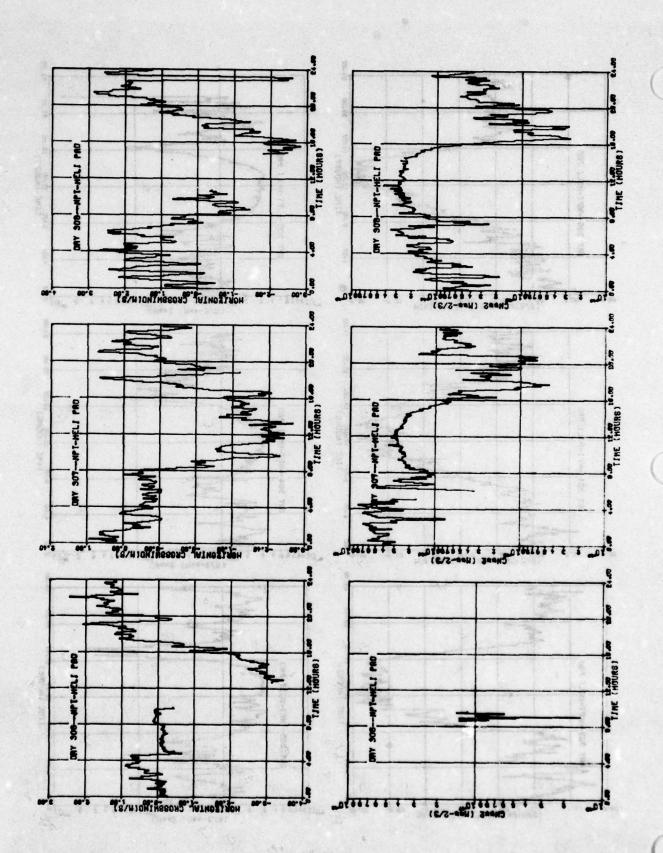


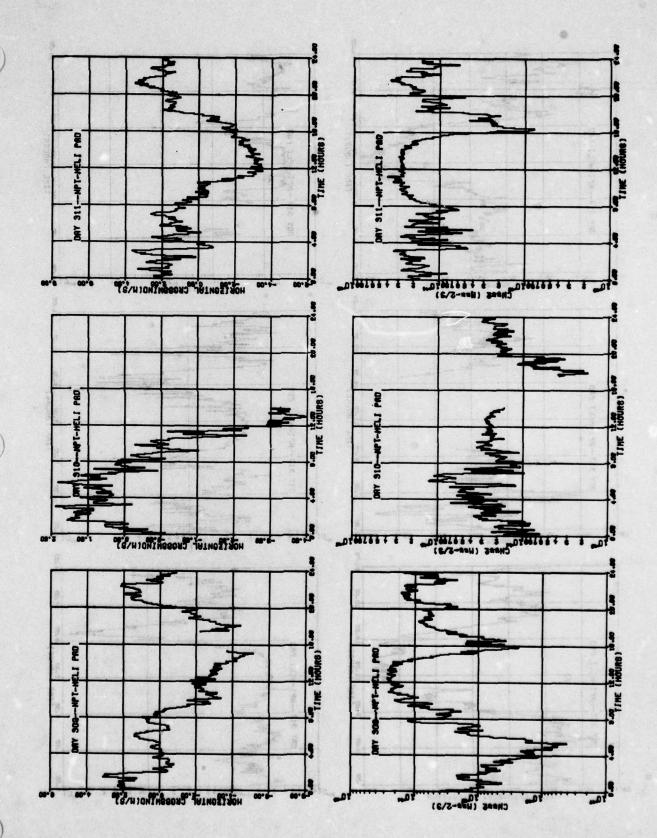


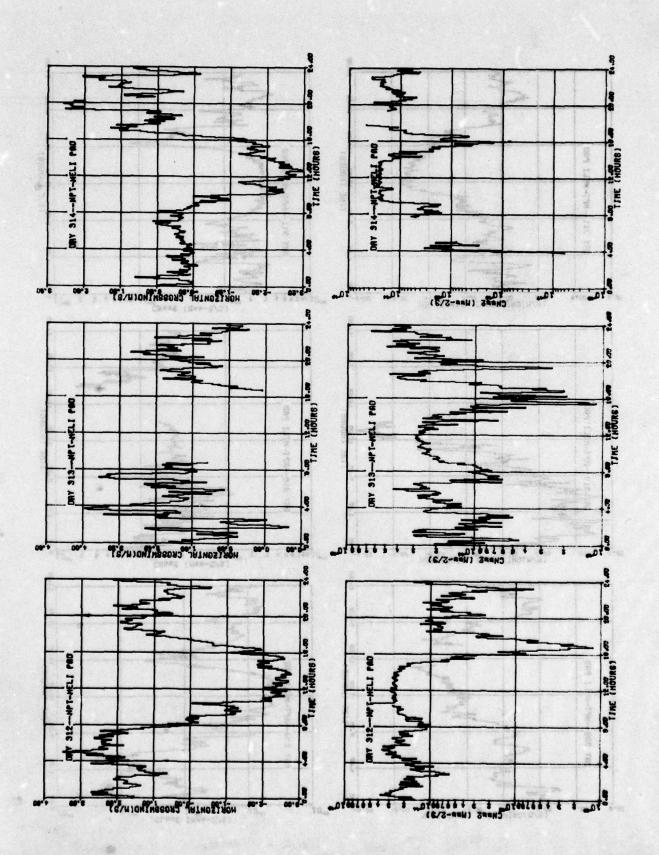


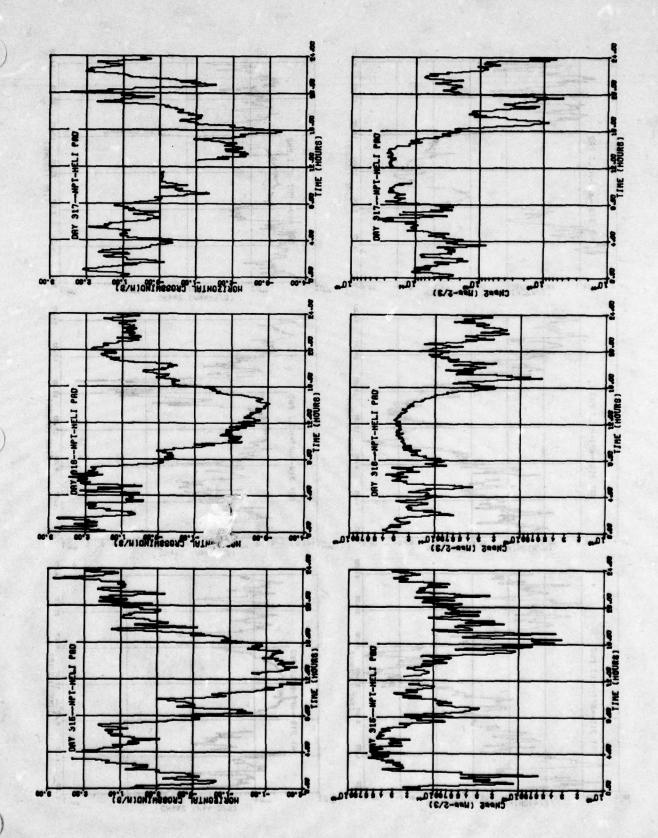


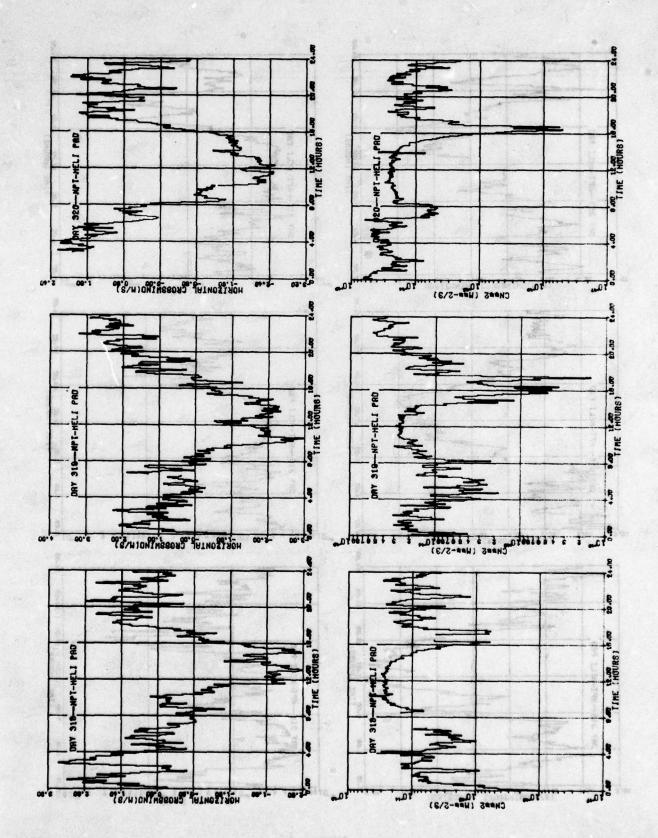


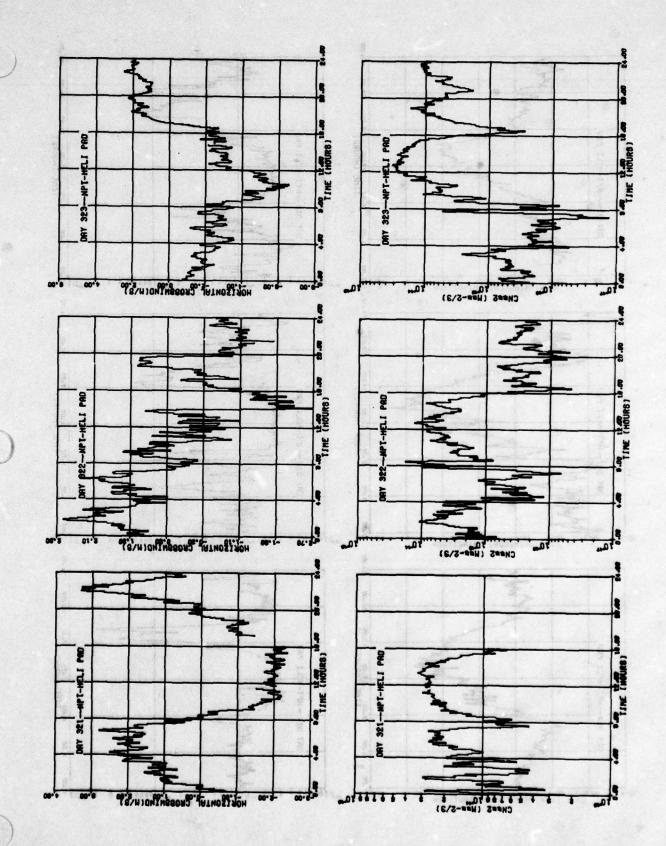


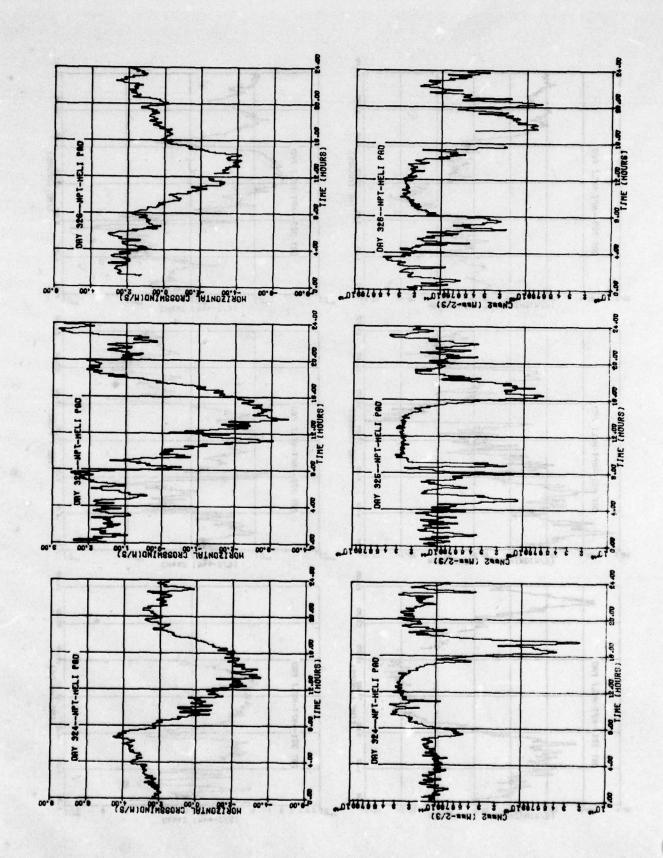


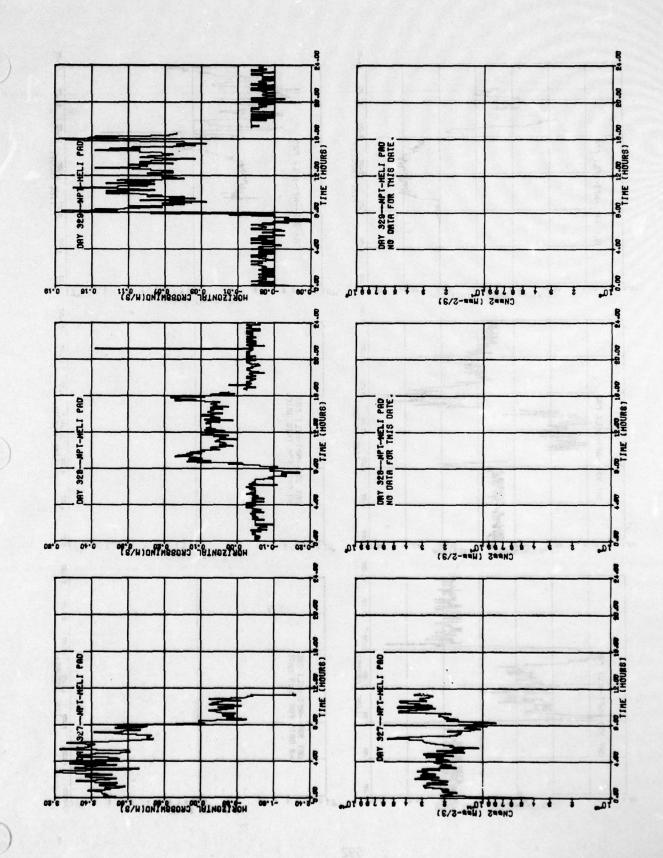


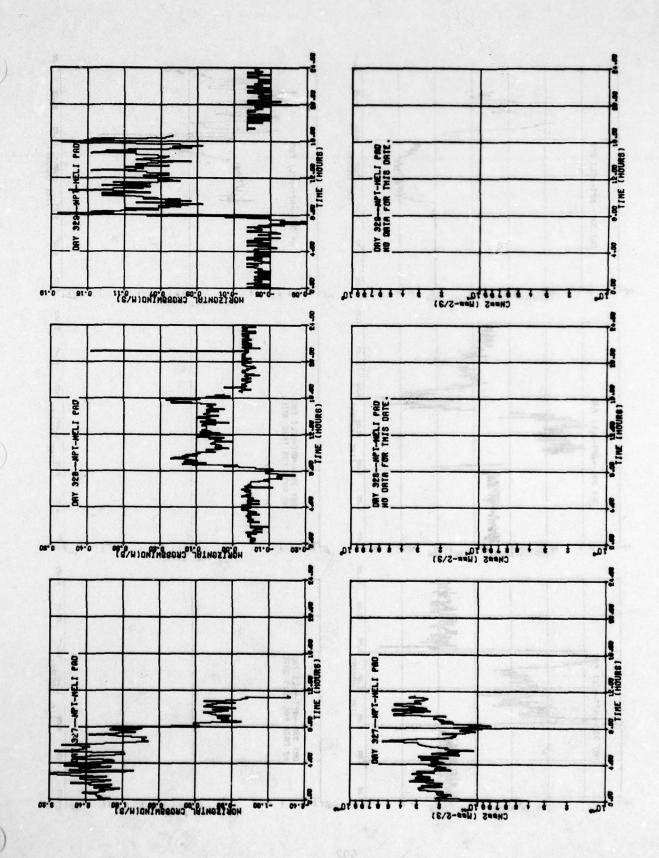


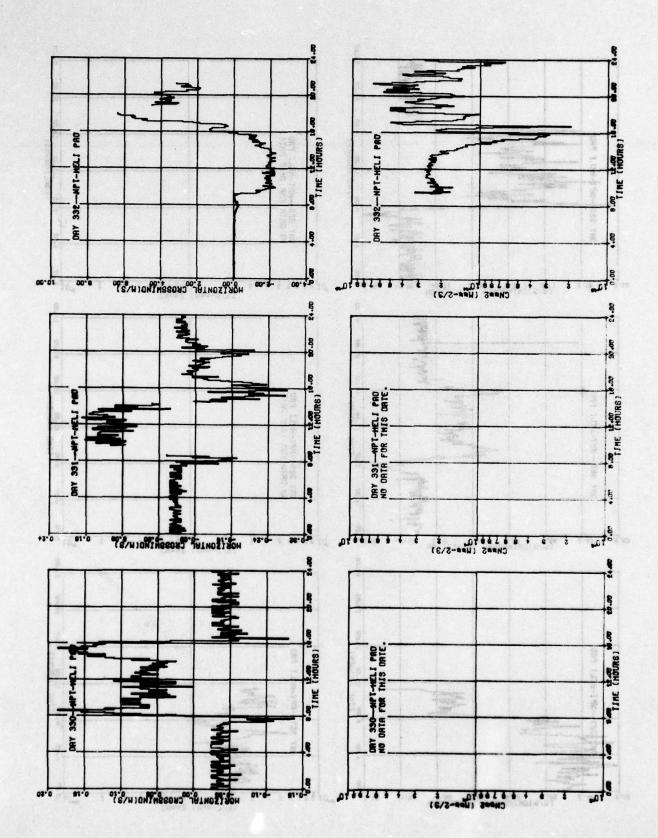


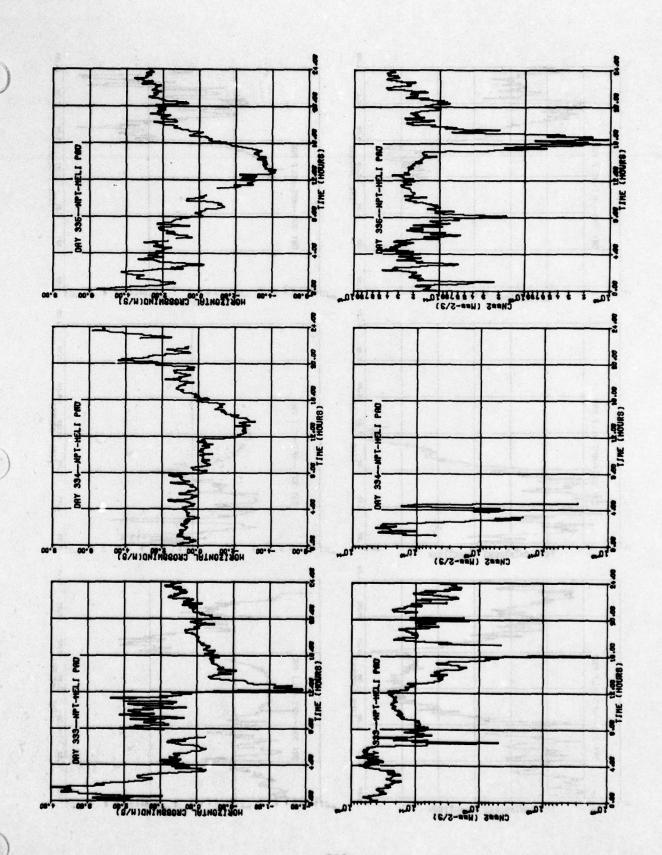


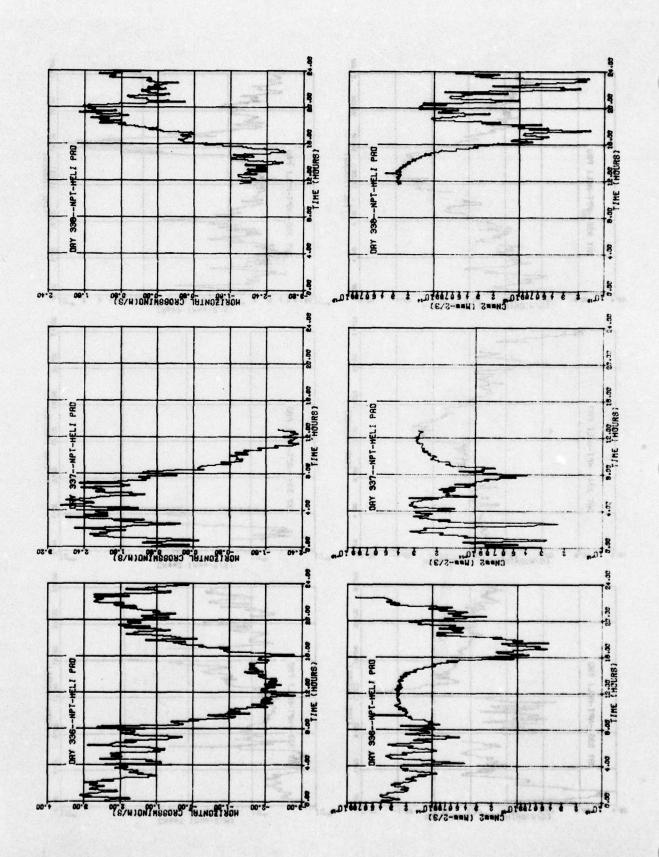


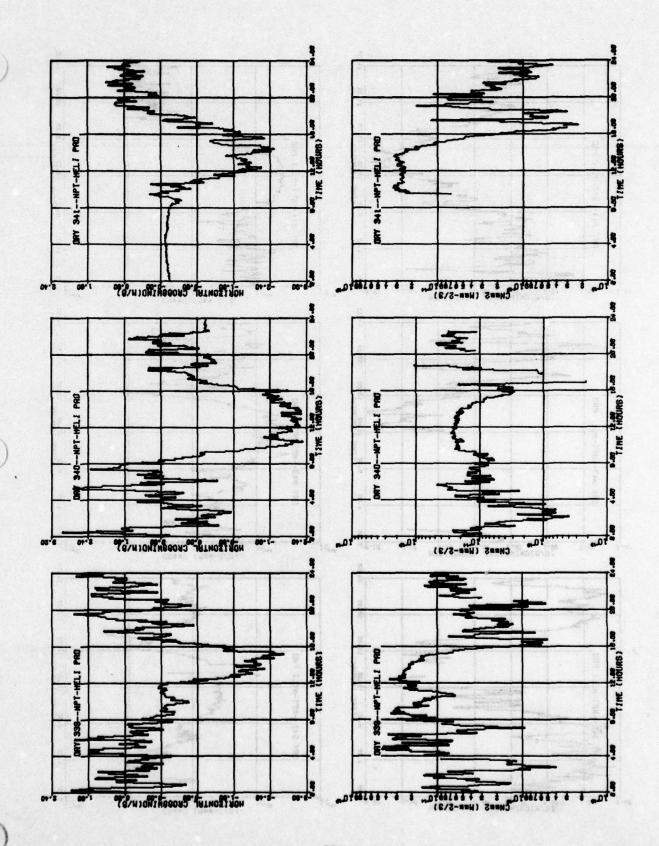


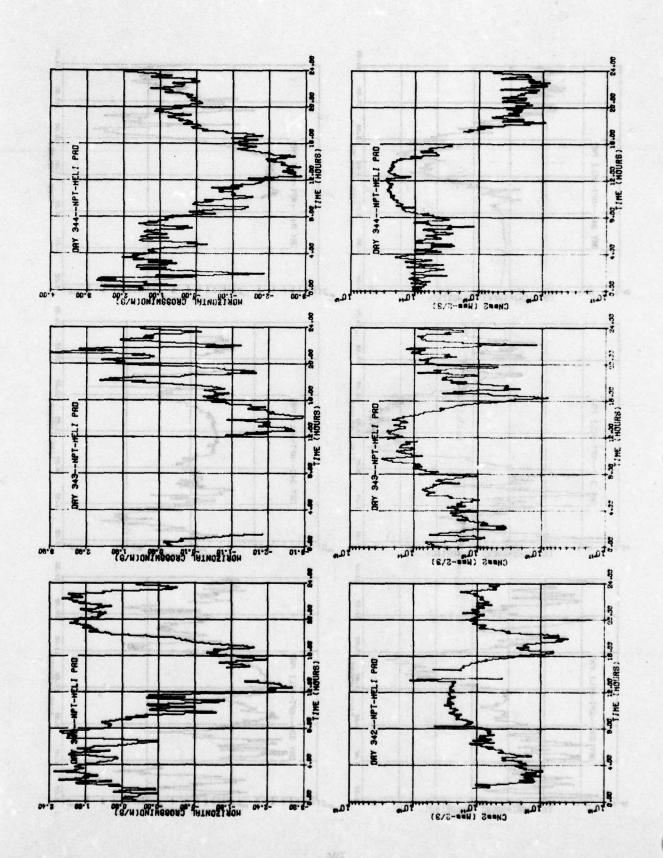


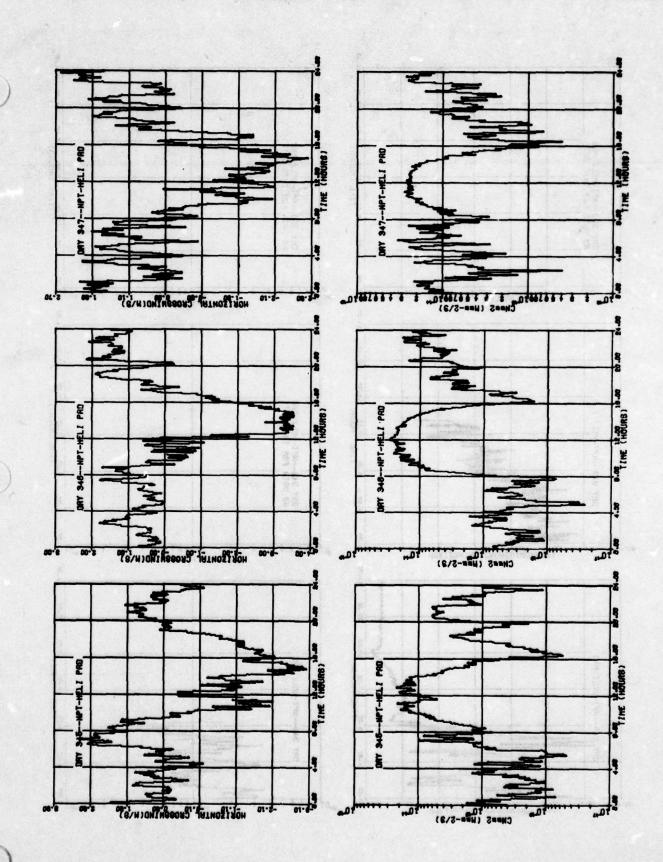


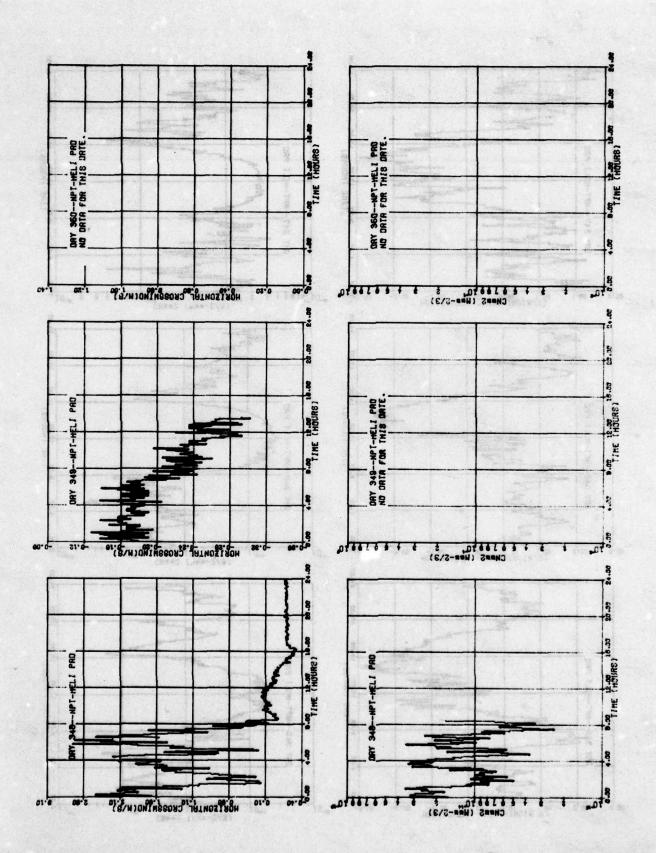










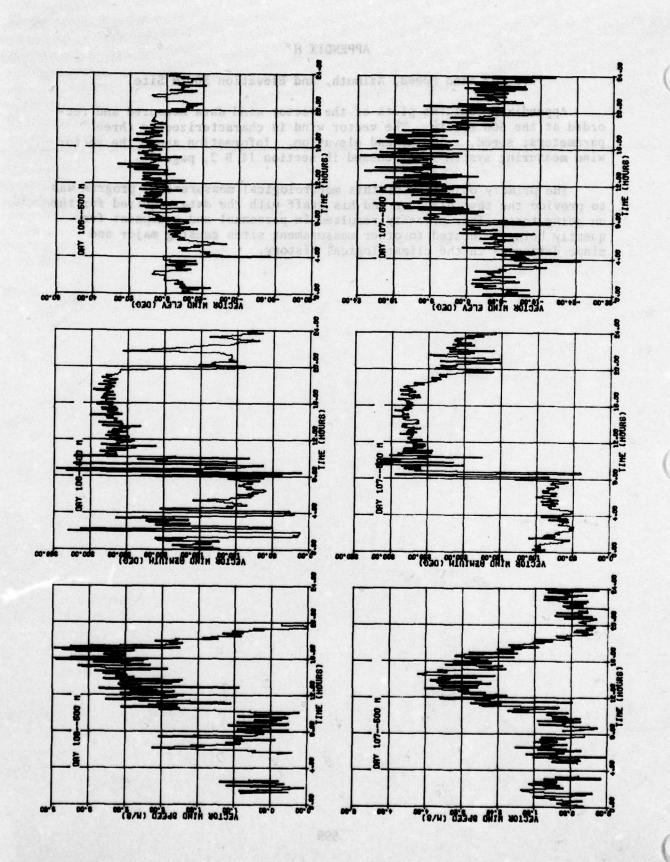


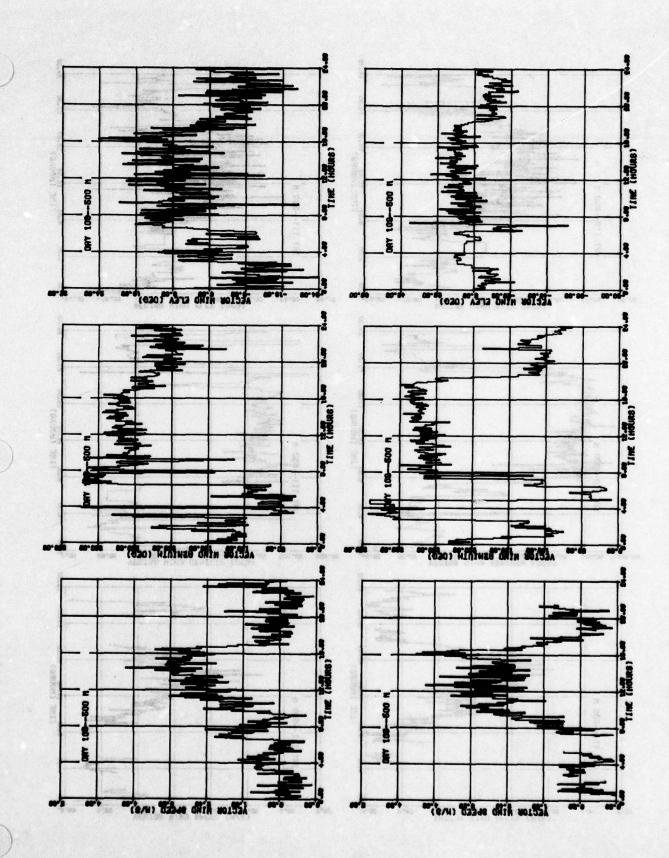
APPENDIX H

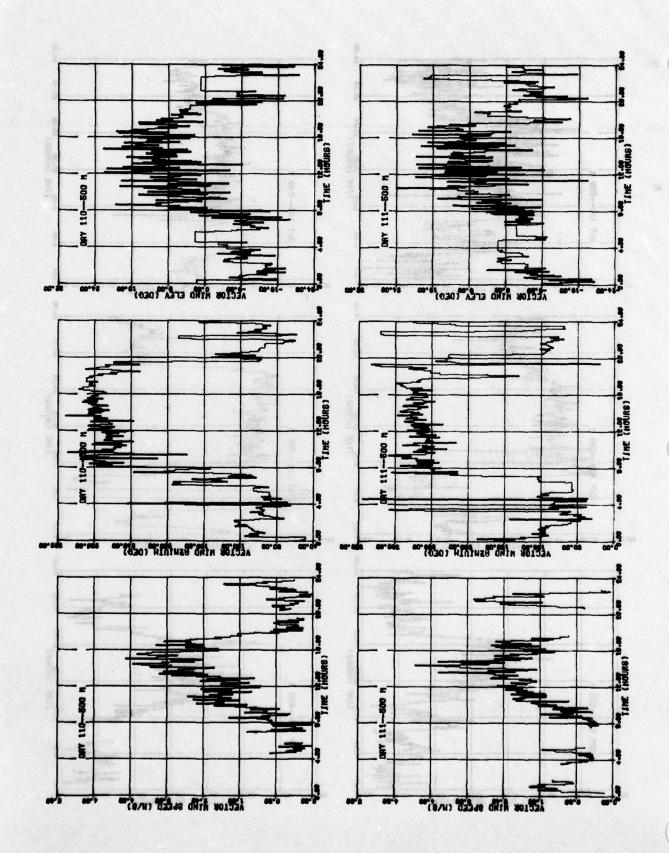
Vector Wind Speed, Azimuth, and Elevation 500 m Site

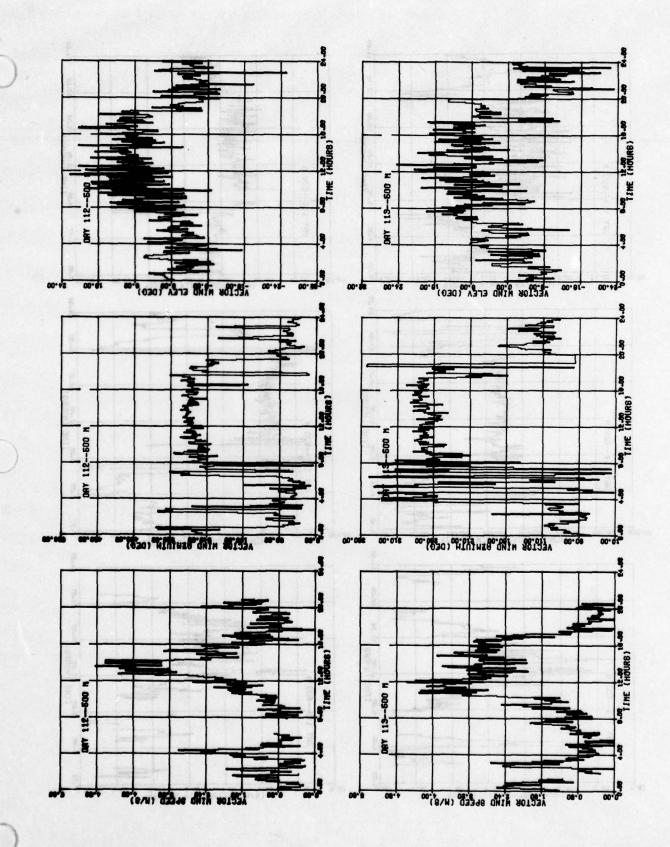
Appendix H contains plots of the vector wind data measured and recorded at the 500 m Site. The vector wind is characterized by three parameters; speed, azimuth, and elevation. Information about the vector wind measuring system is discussed in section II B 2, page 12.

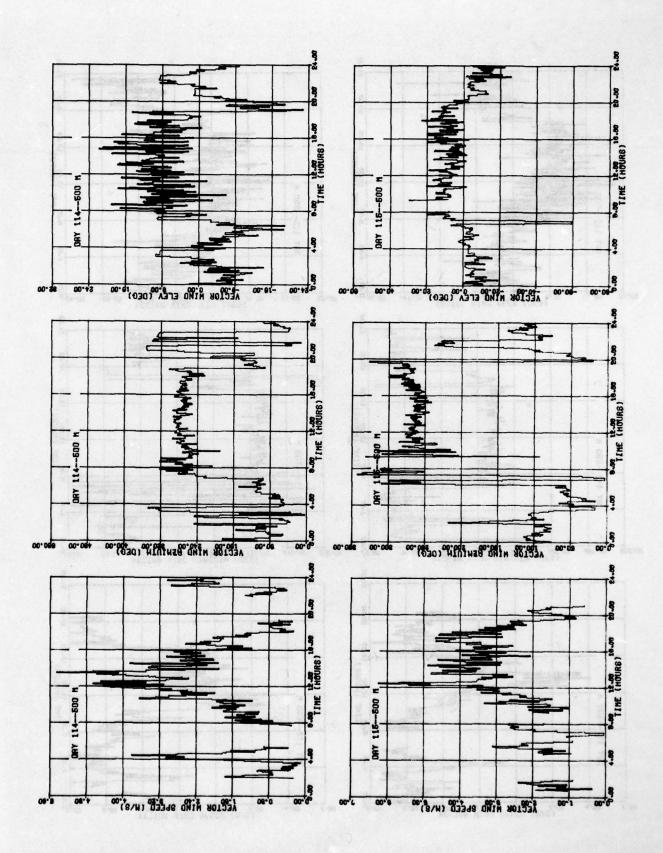
The primary objective of this meterological measurements program was to provide the test director and his staff with the data required for the on going test. This priority resulted in personnel and equipment frequently being relocated to other measurement sites causing major and minor data gaps in the climatological history.

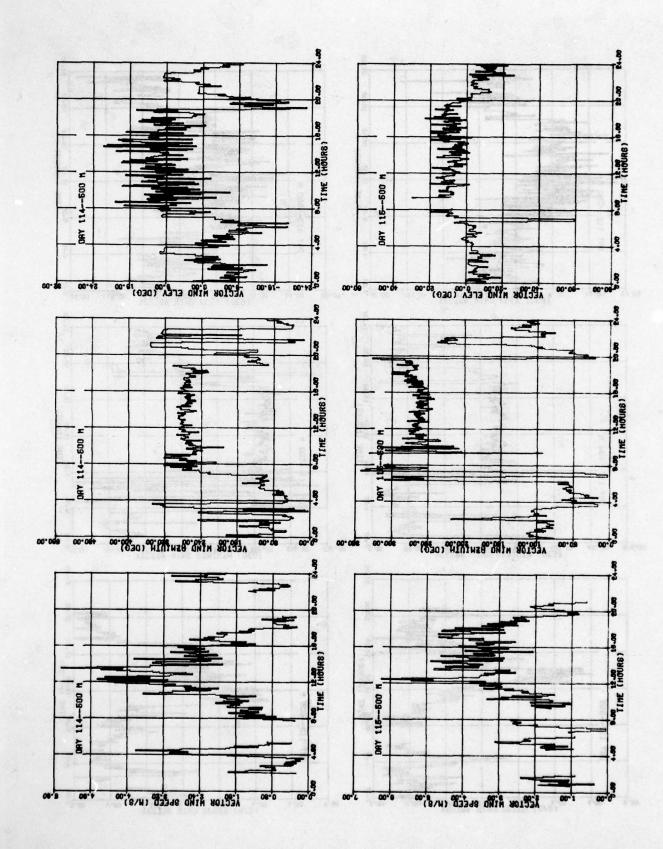


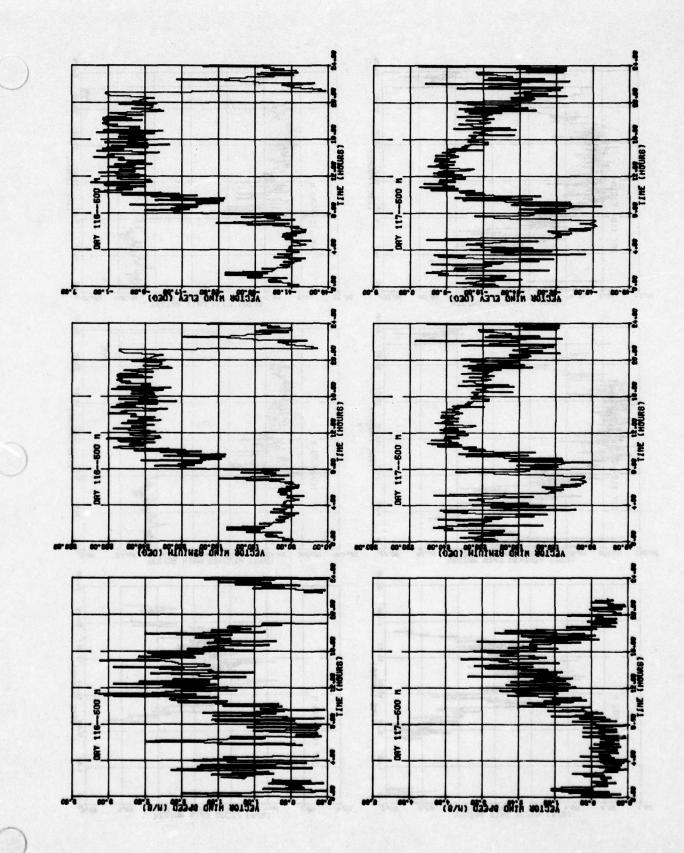


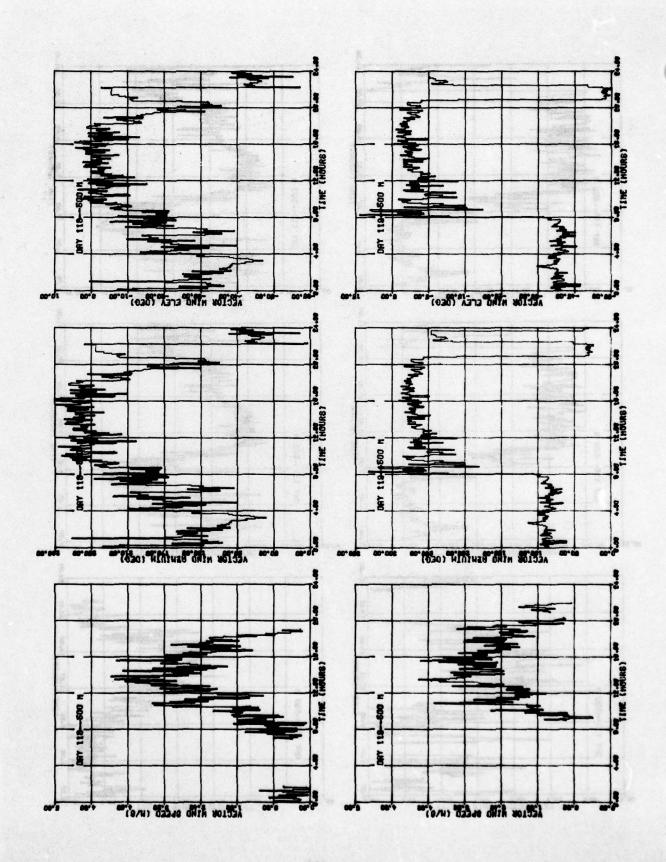


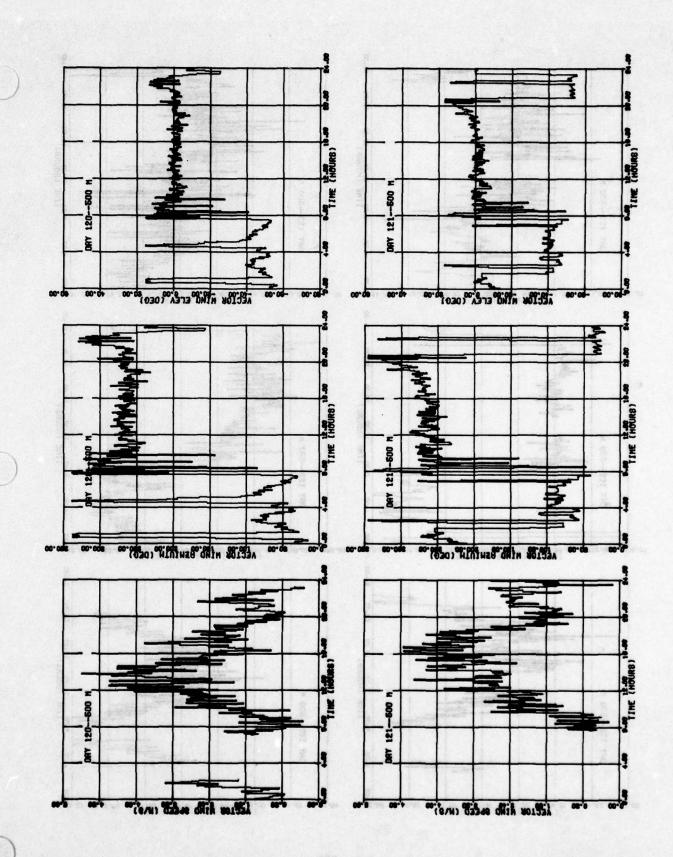


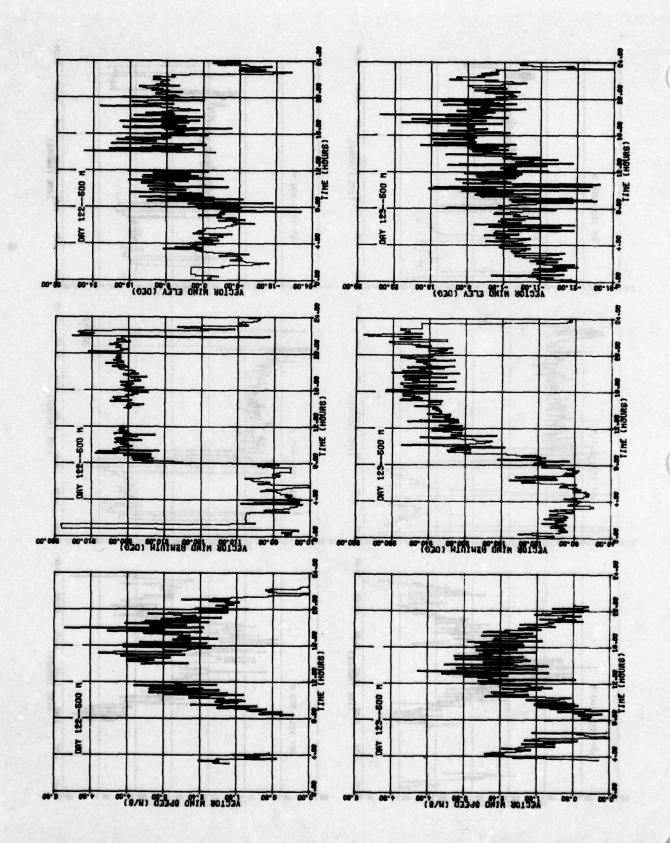


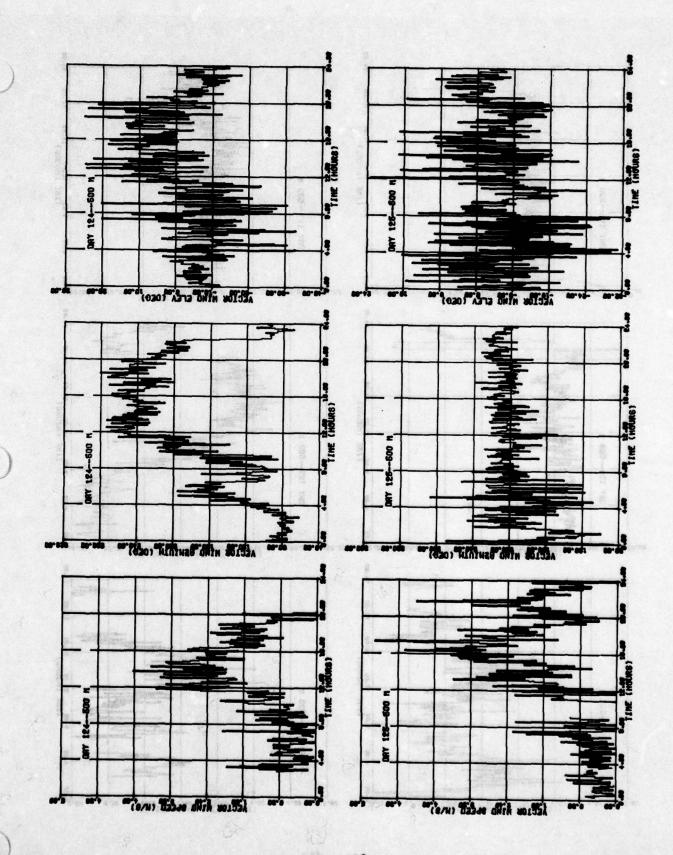


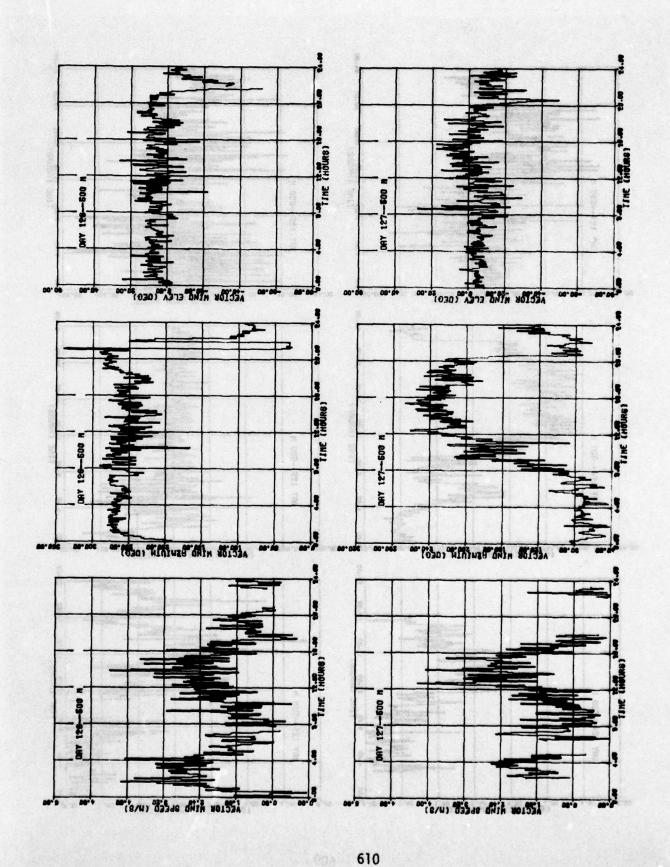


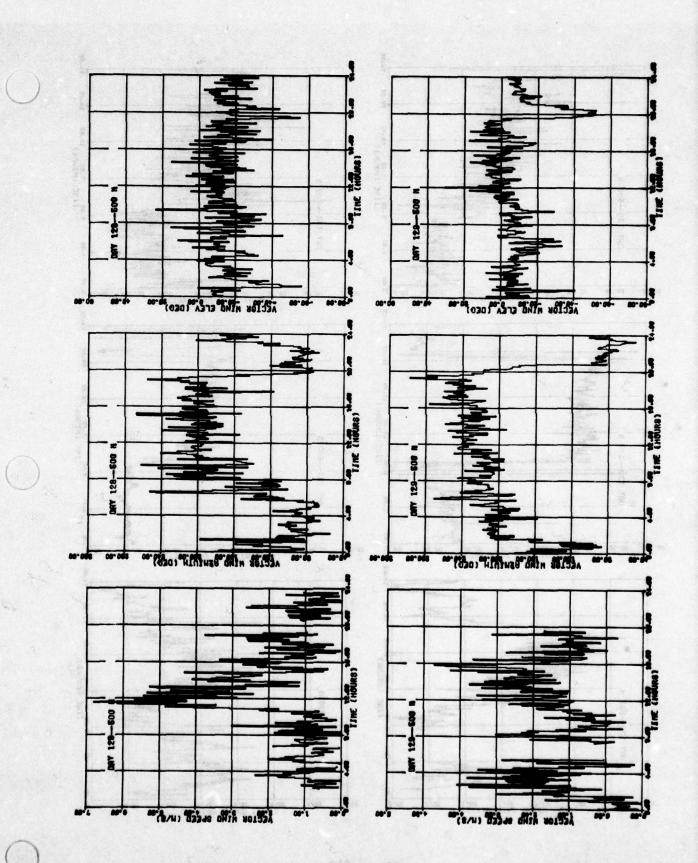


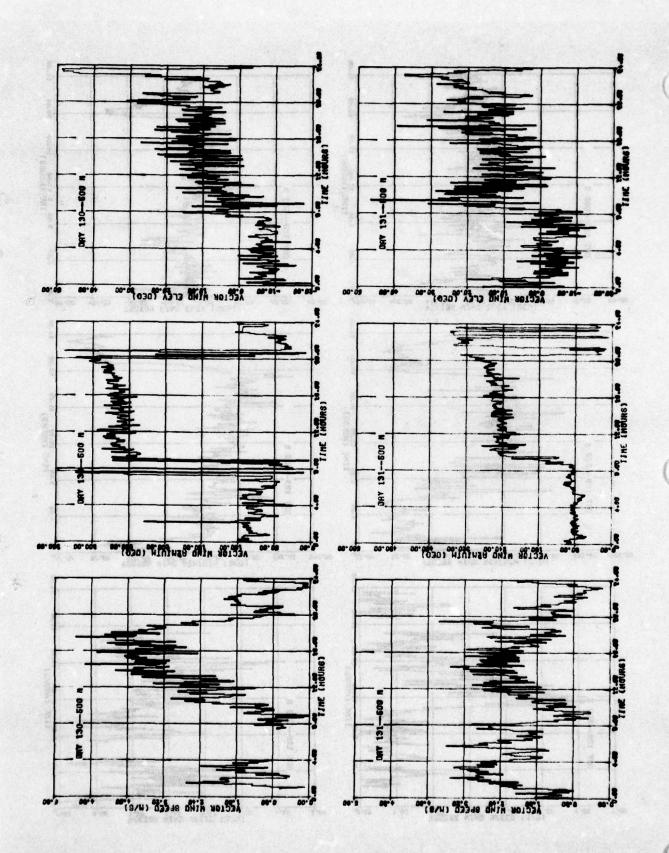


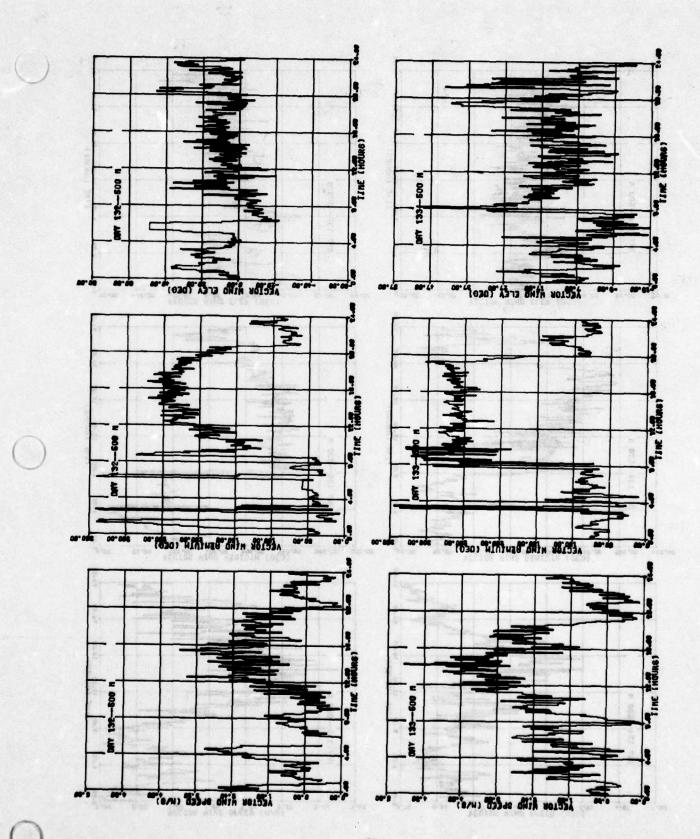


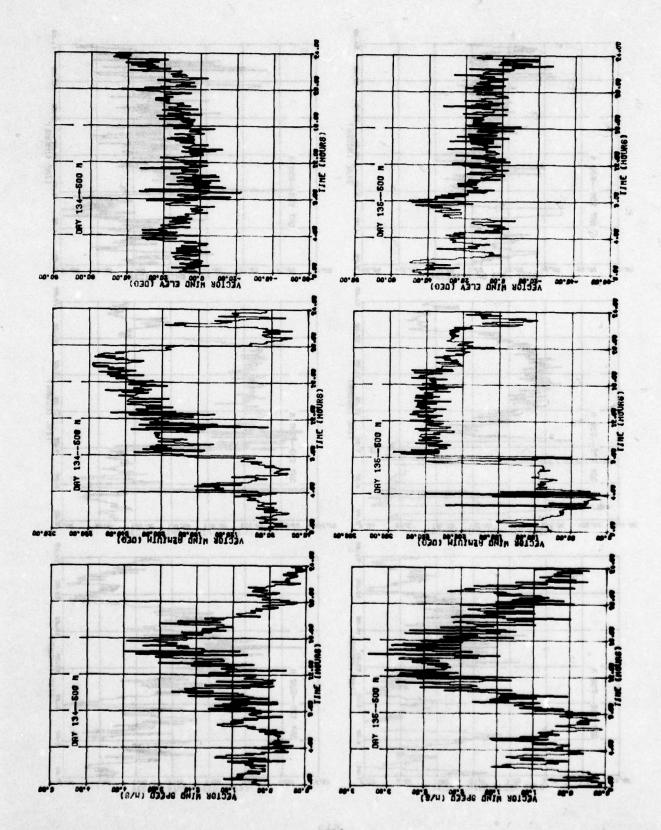


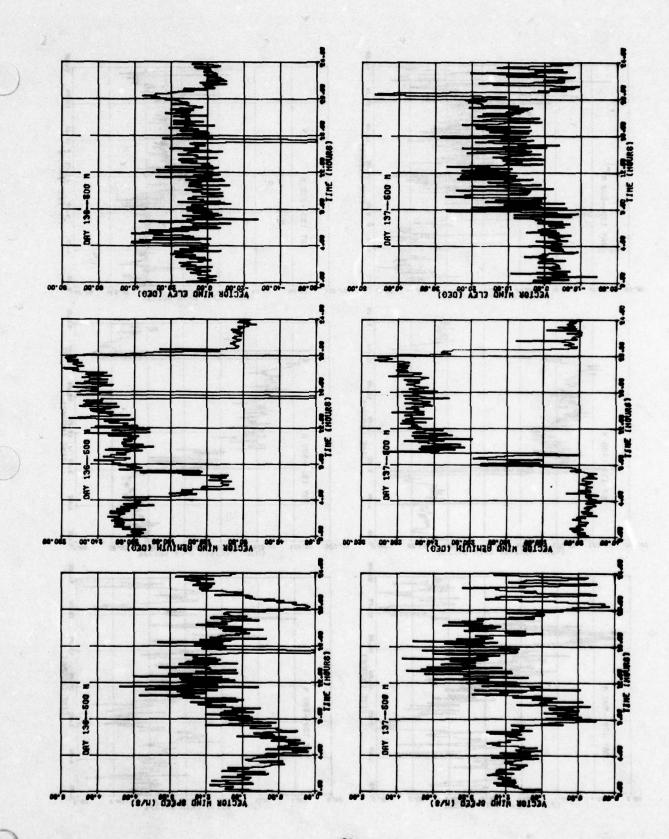


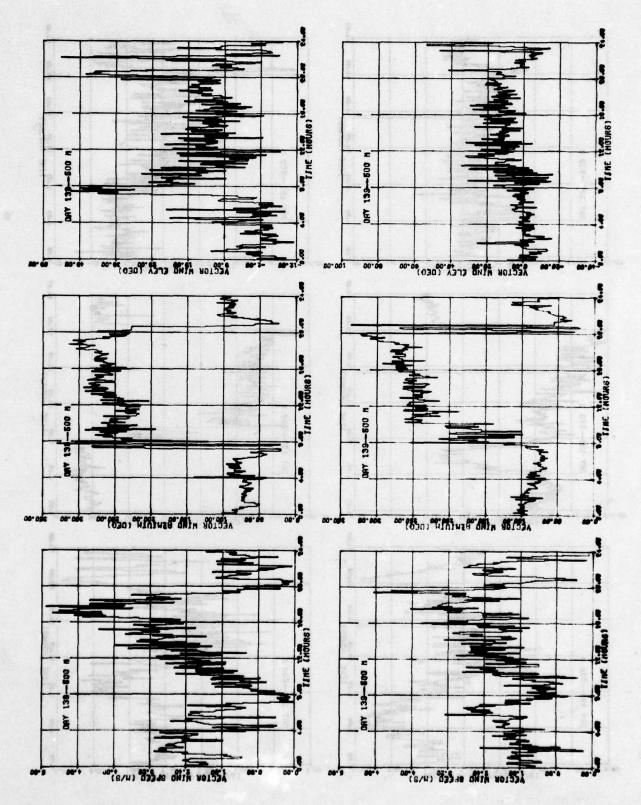


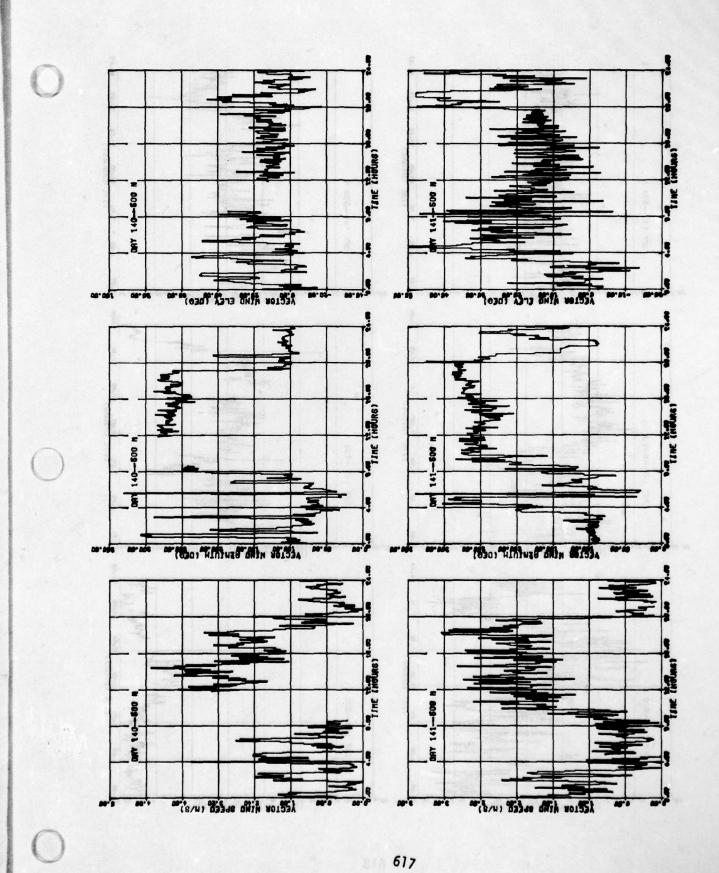


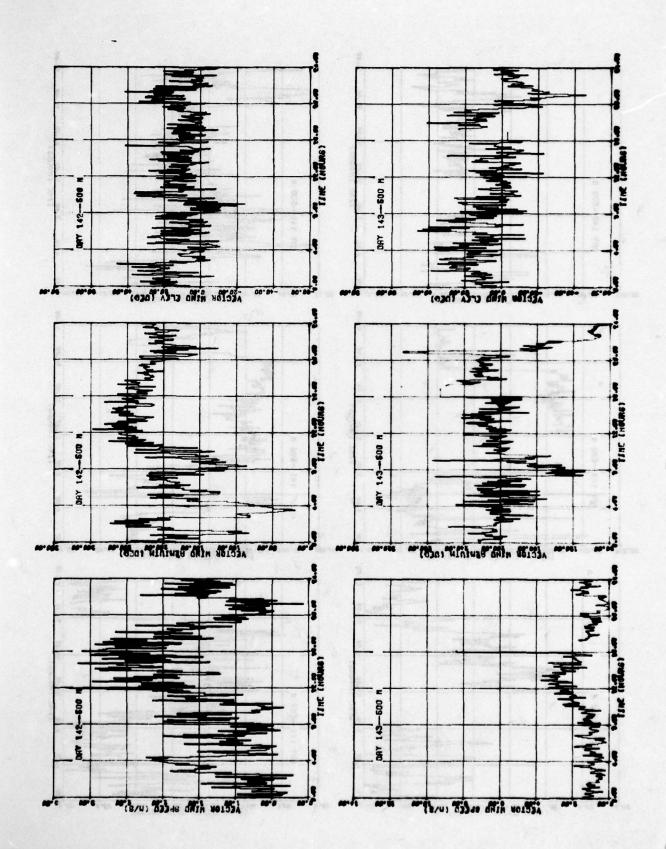


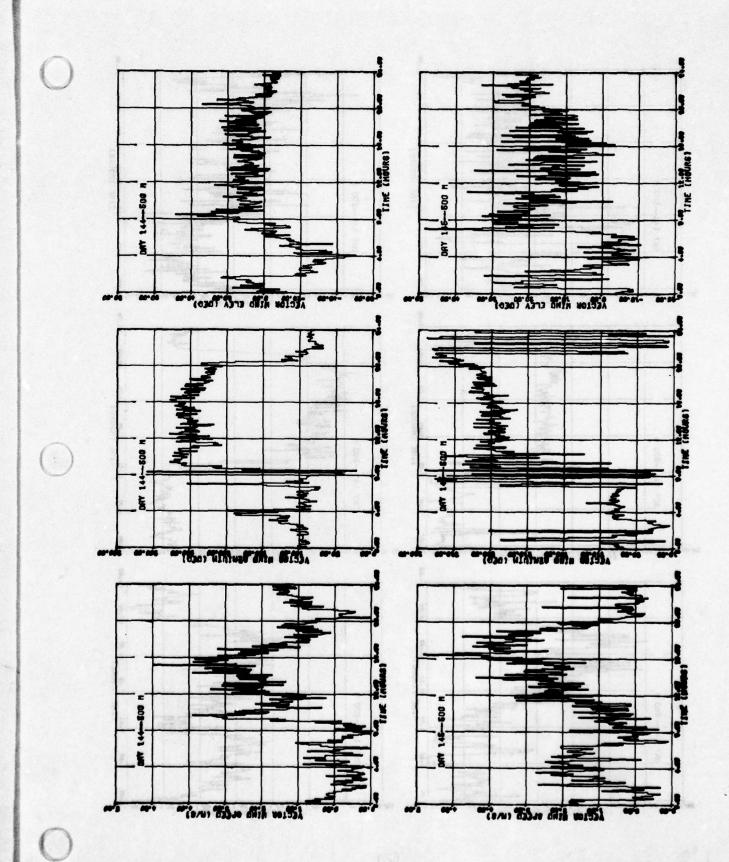


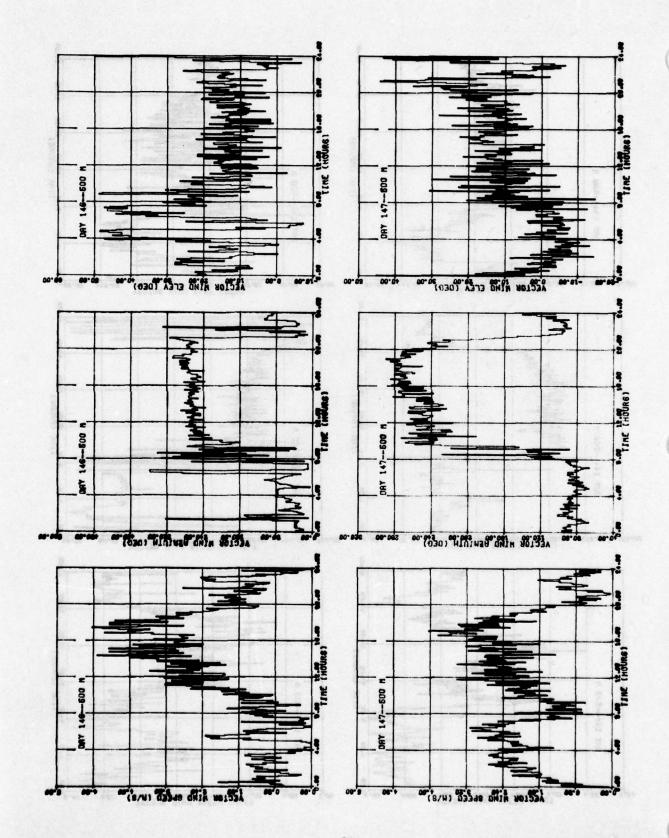


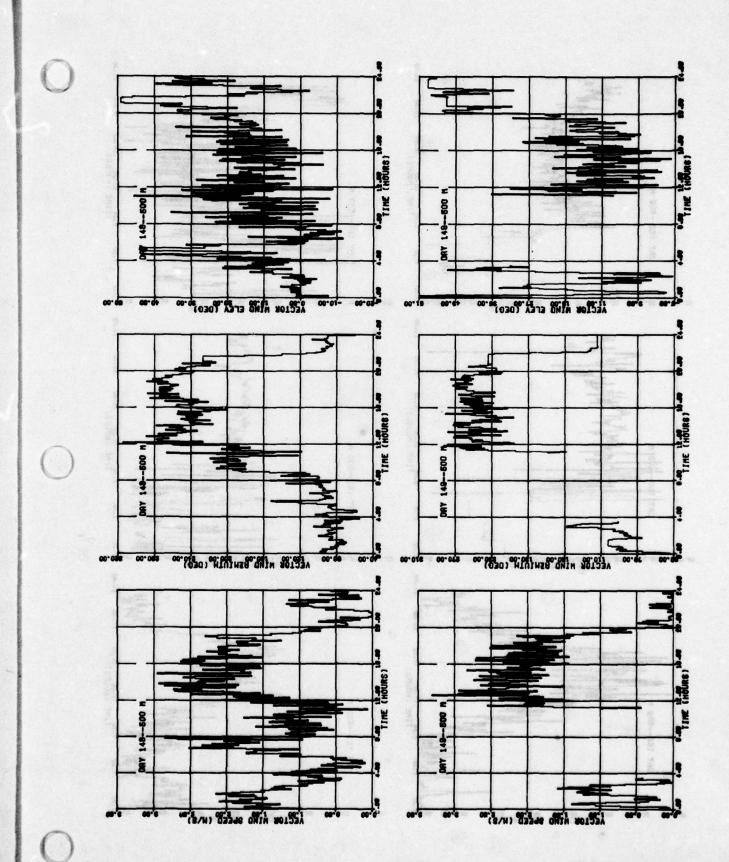


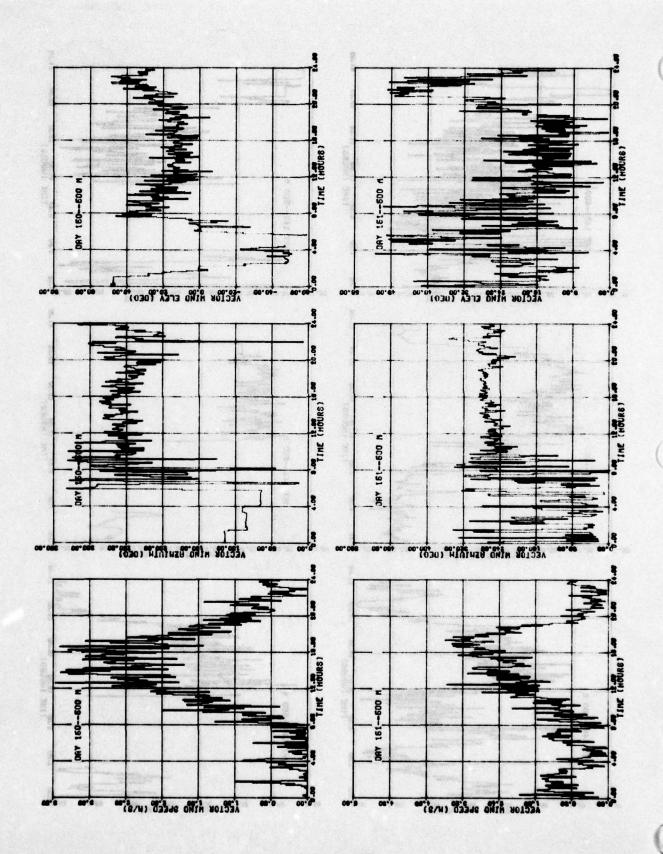


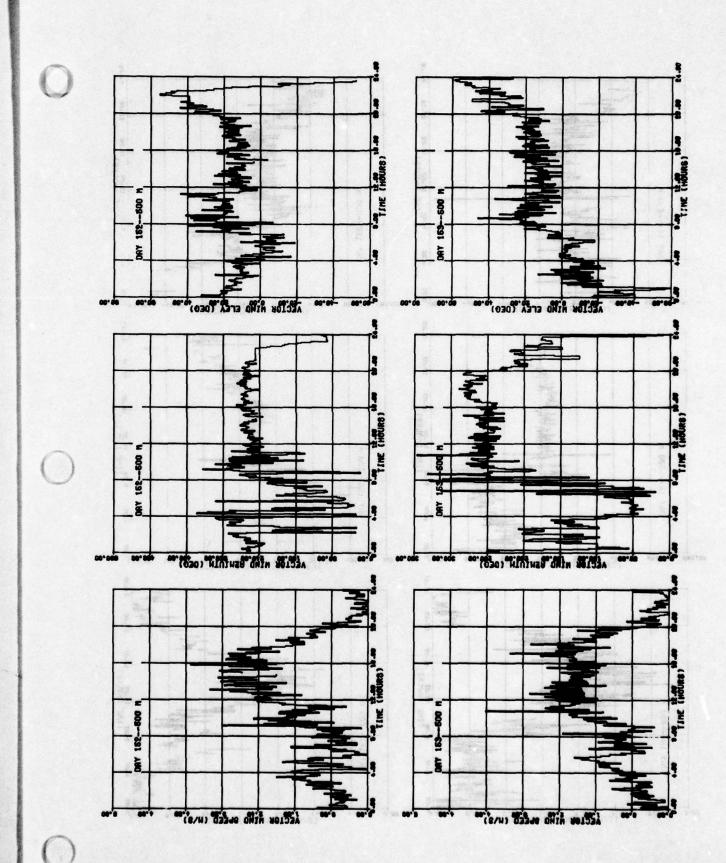


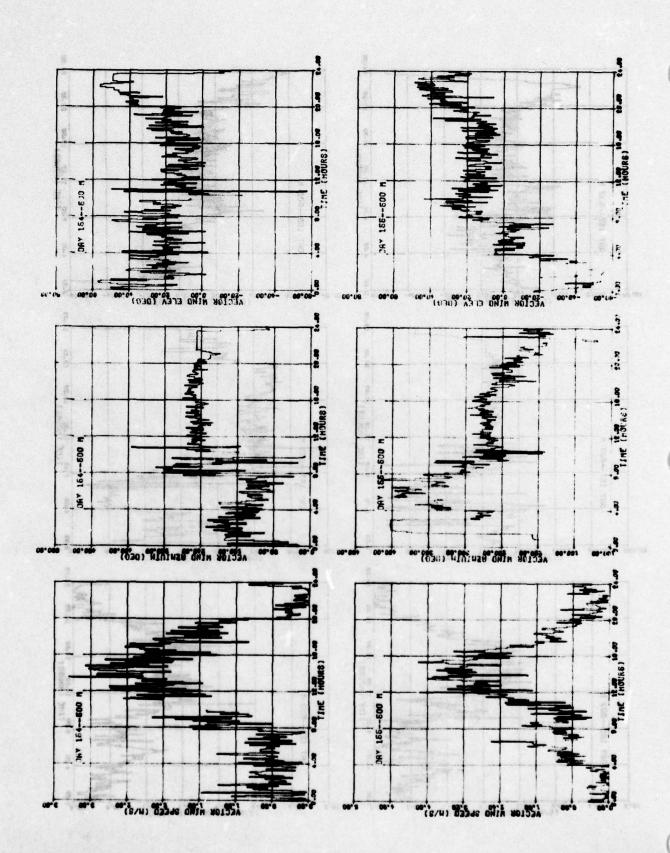


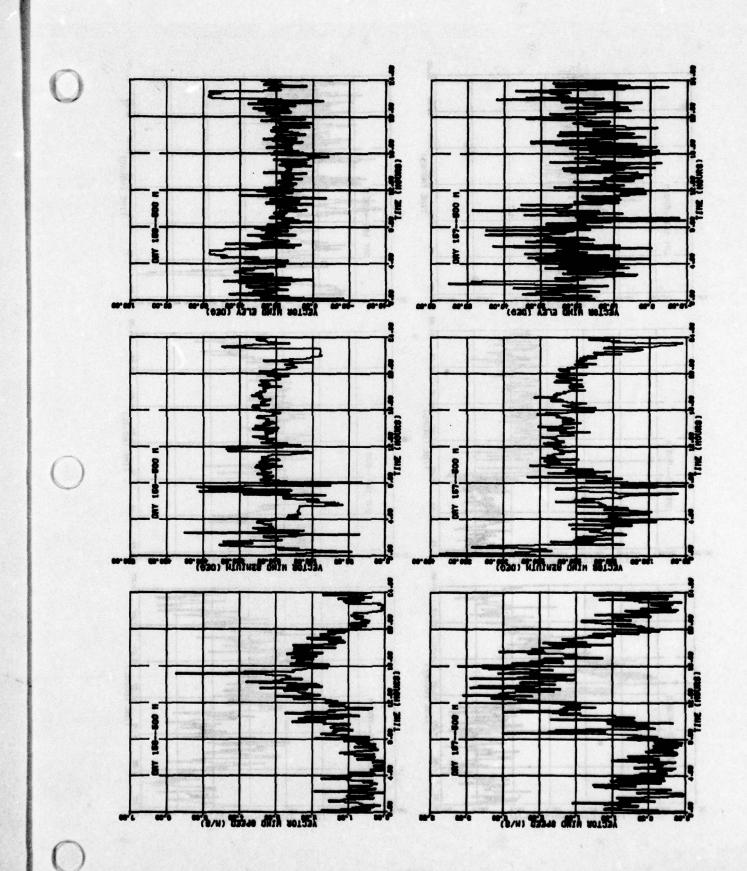


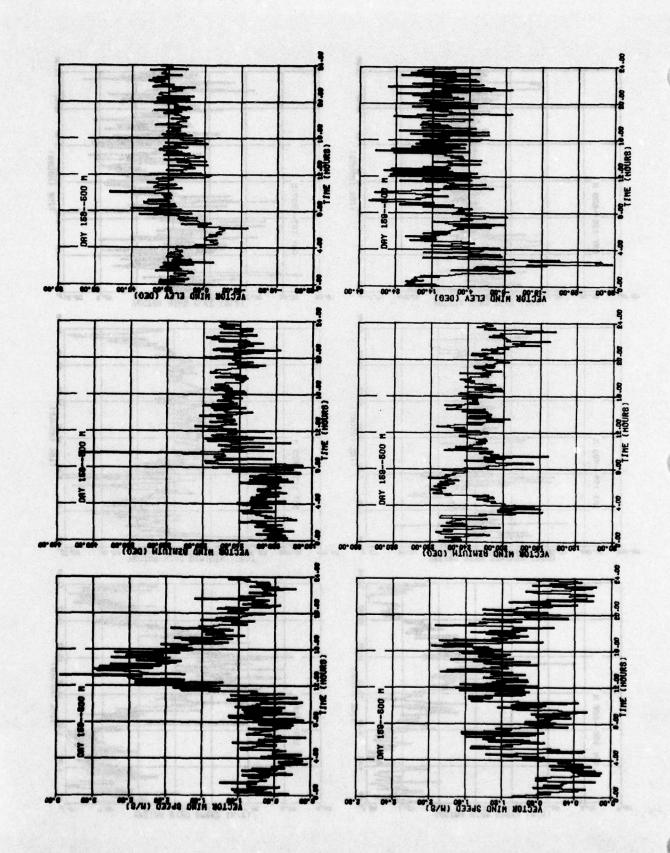


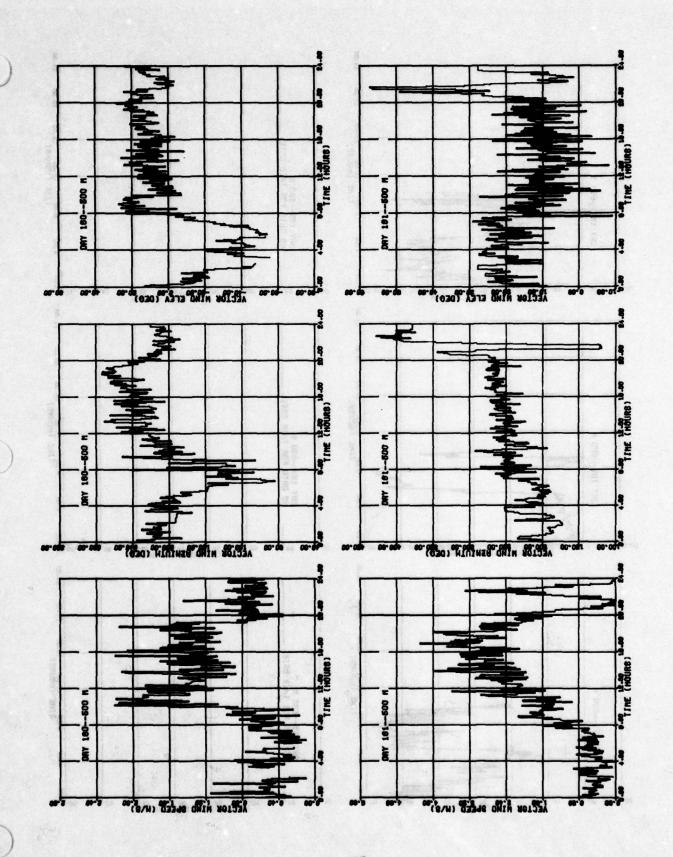


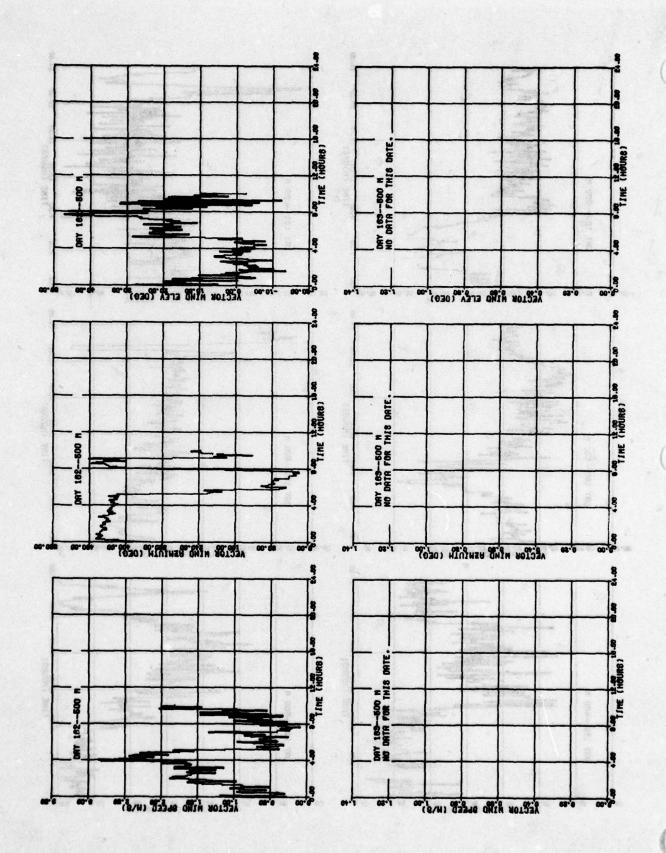


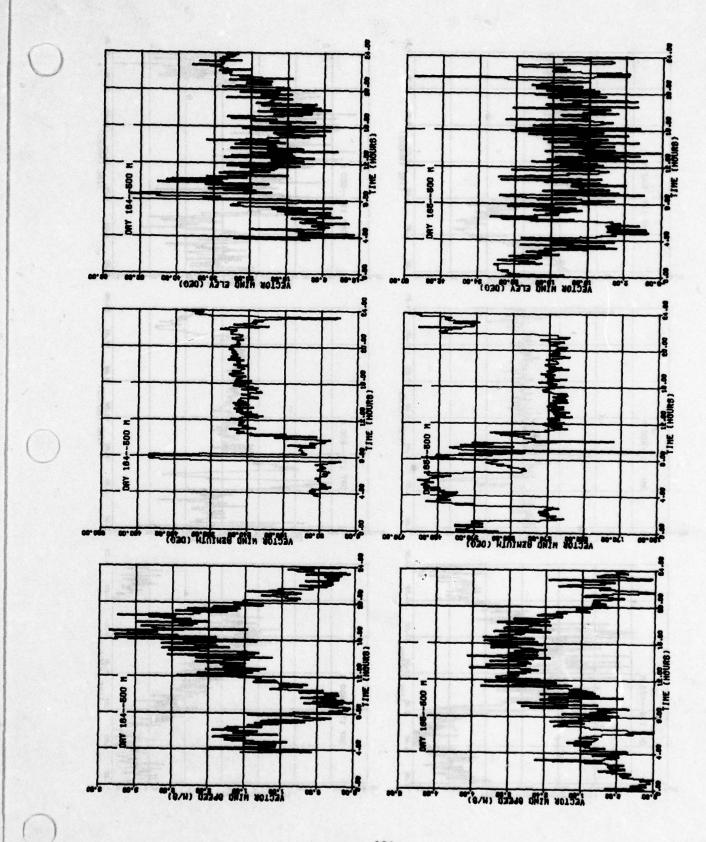


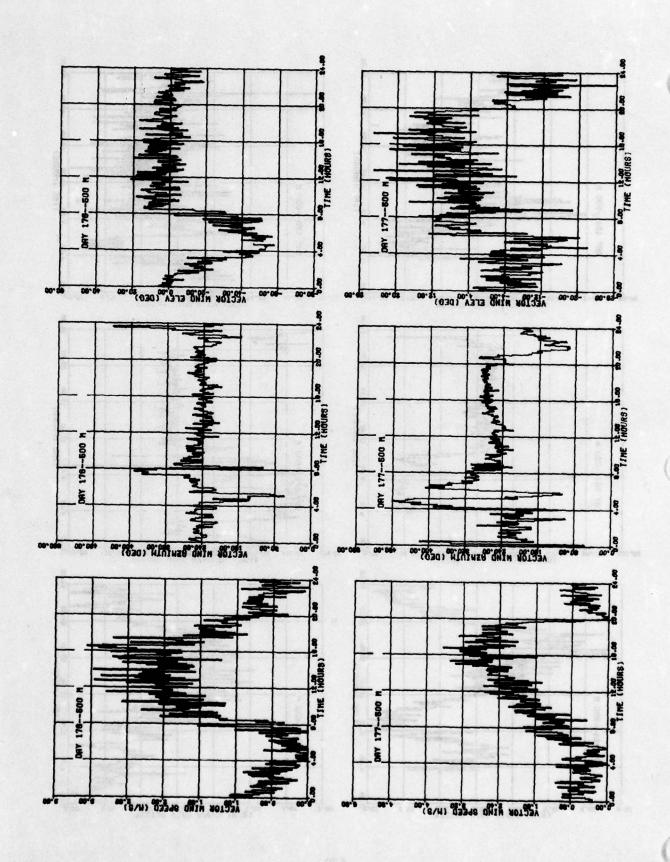


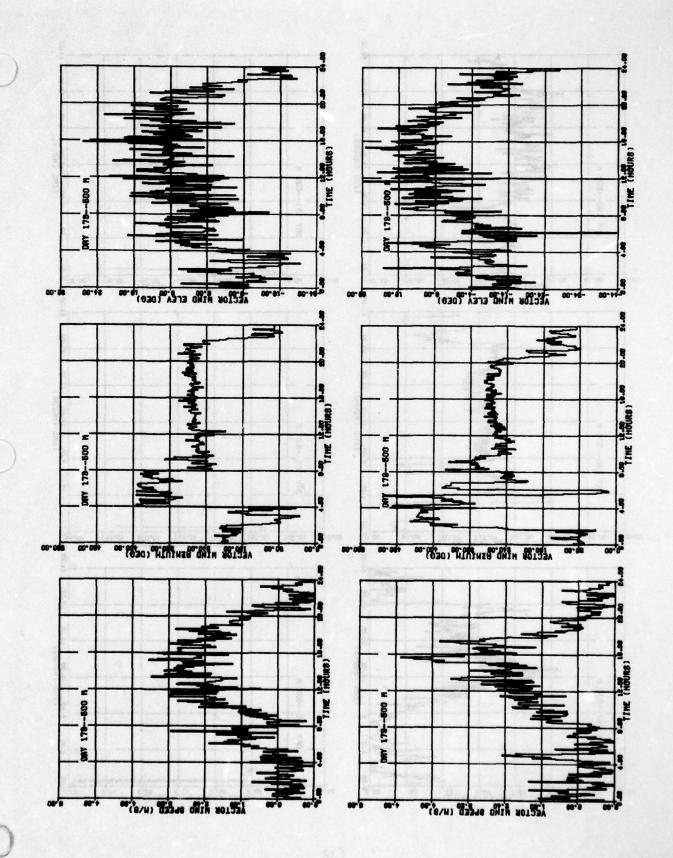


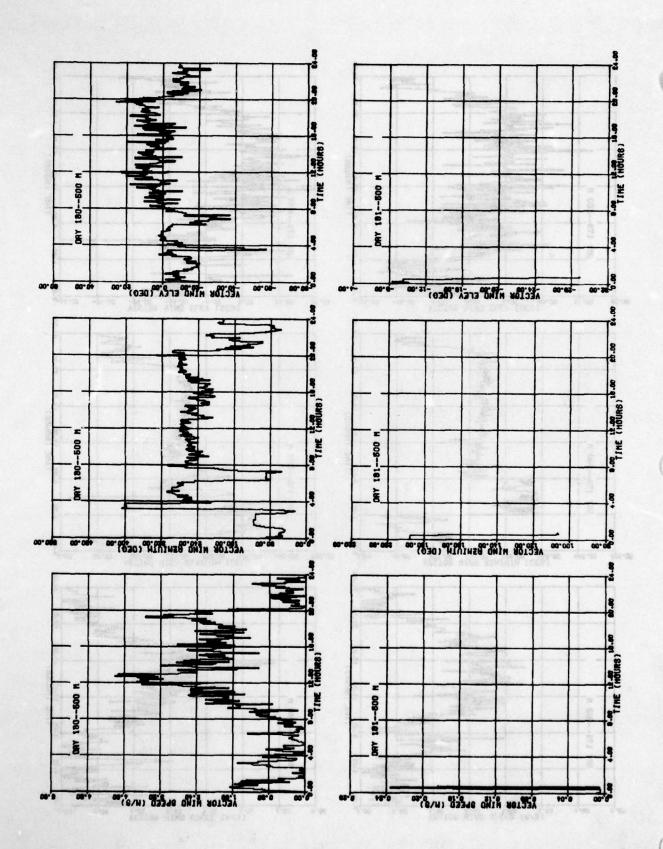


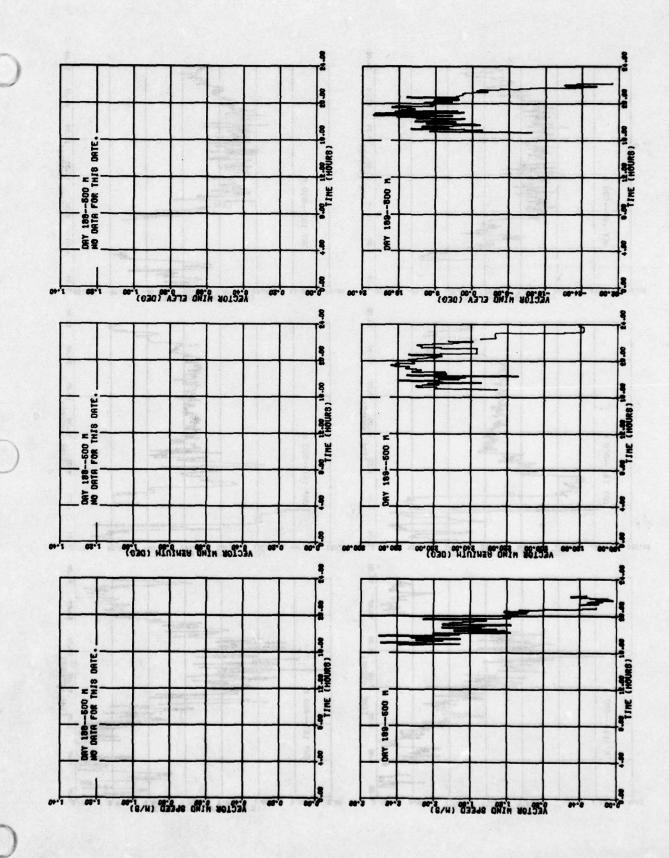


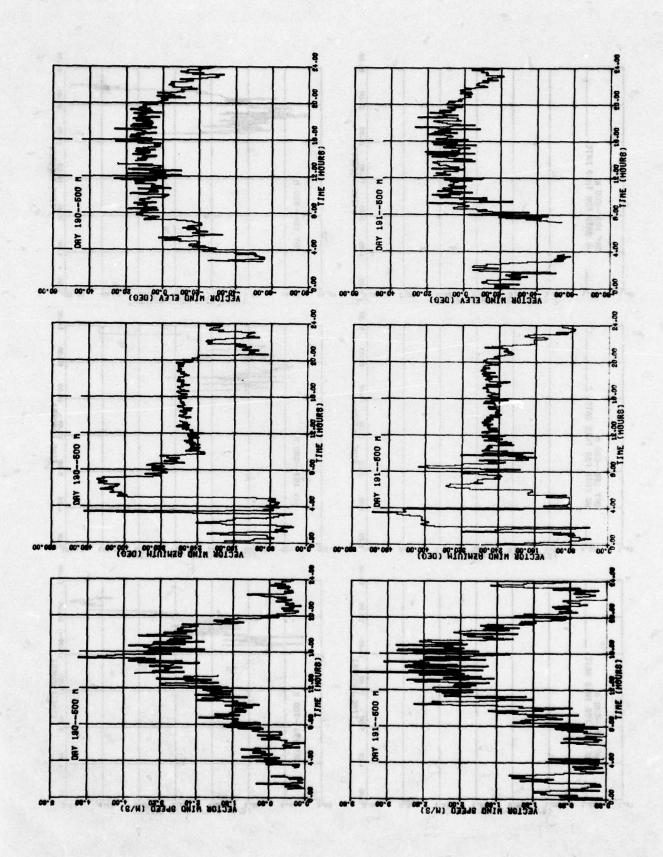


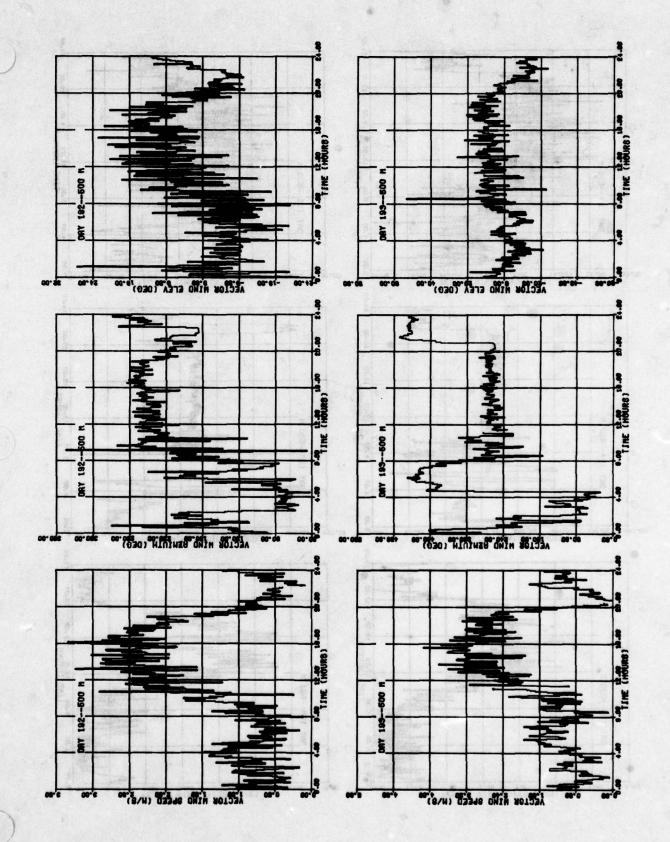


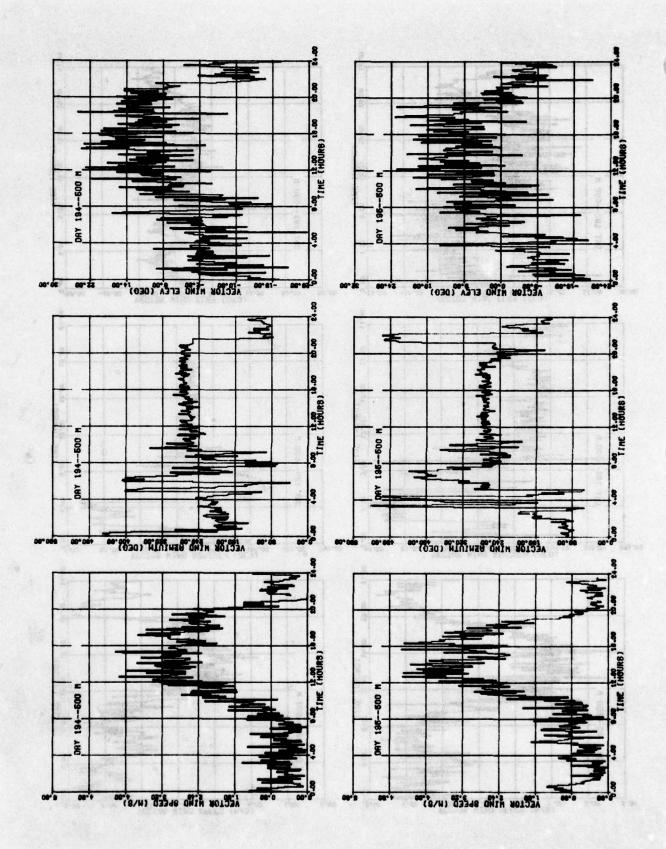


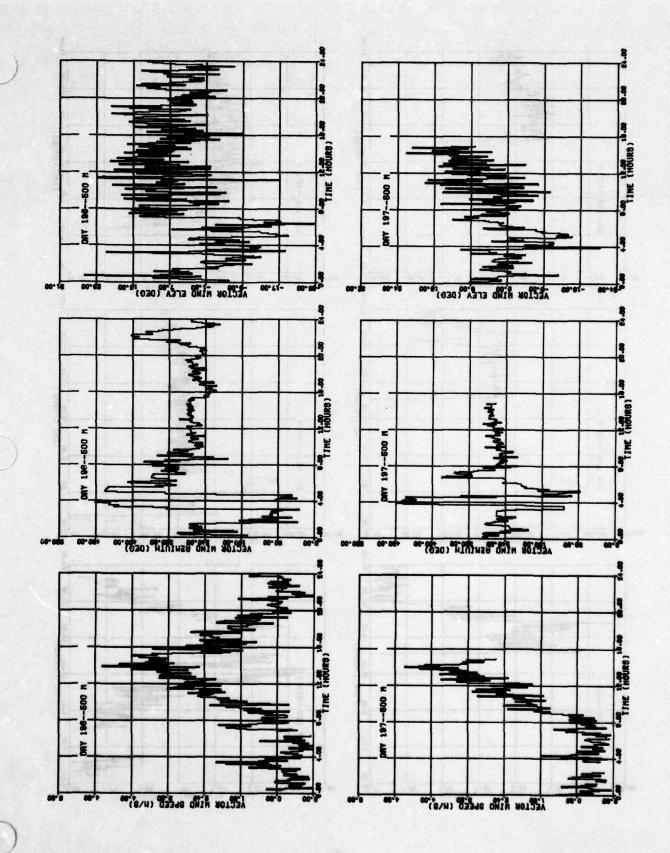


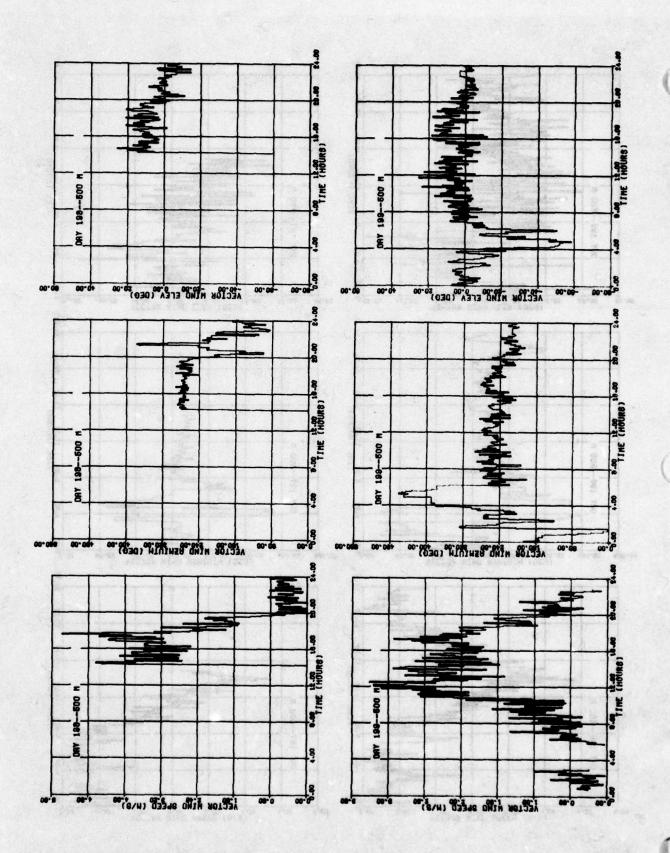


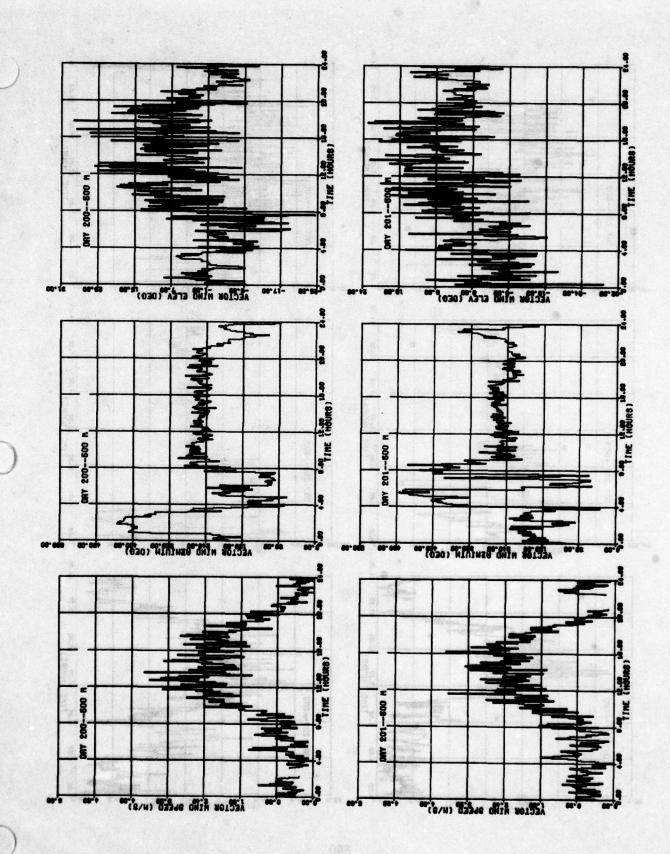


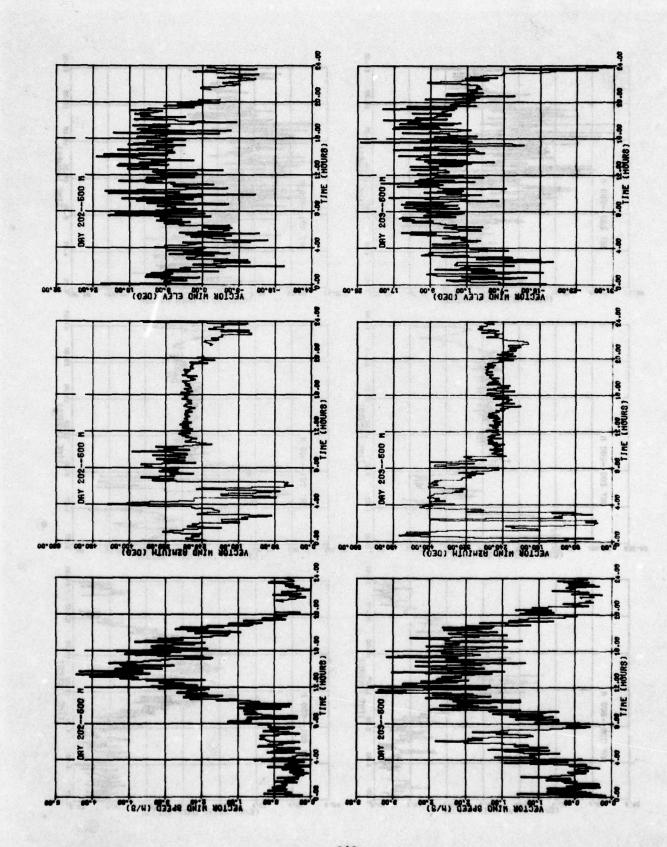


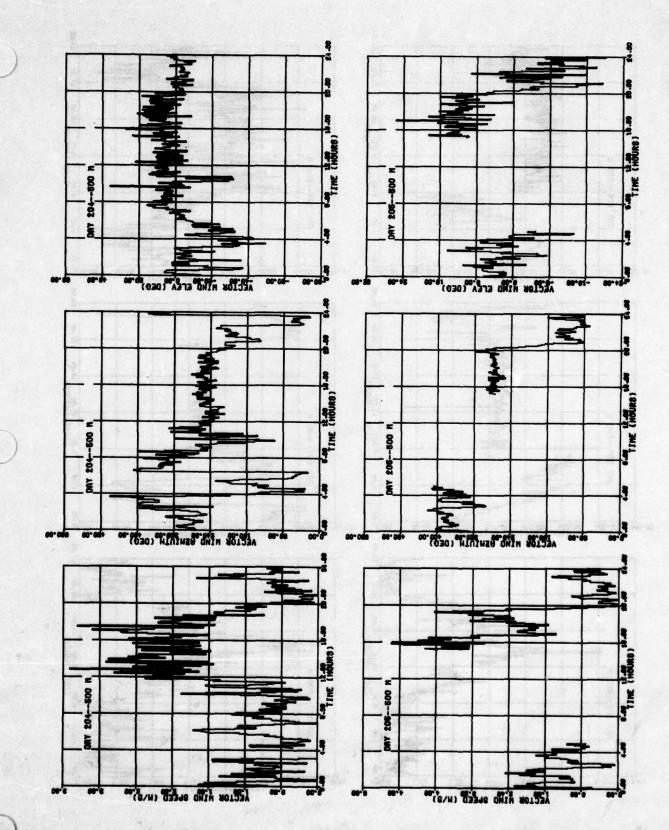


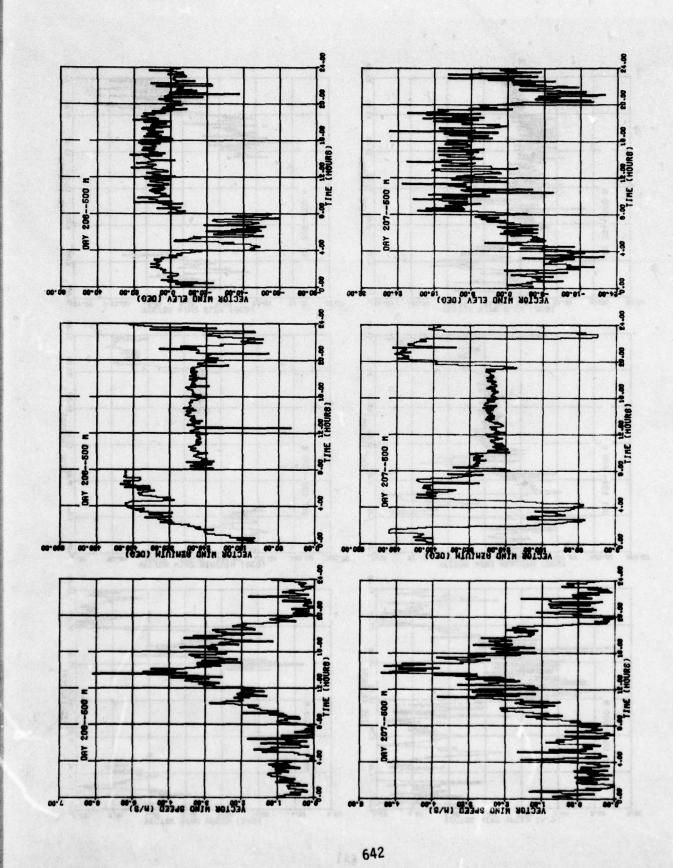


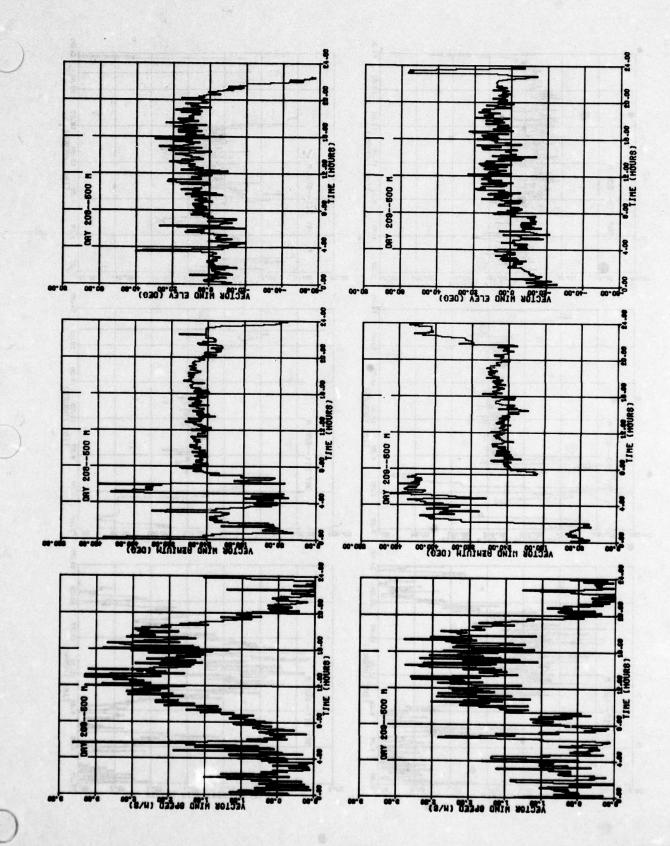


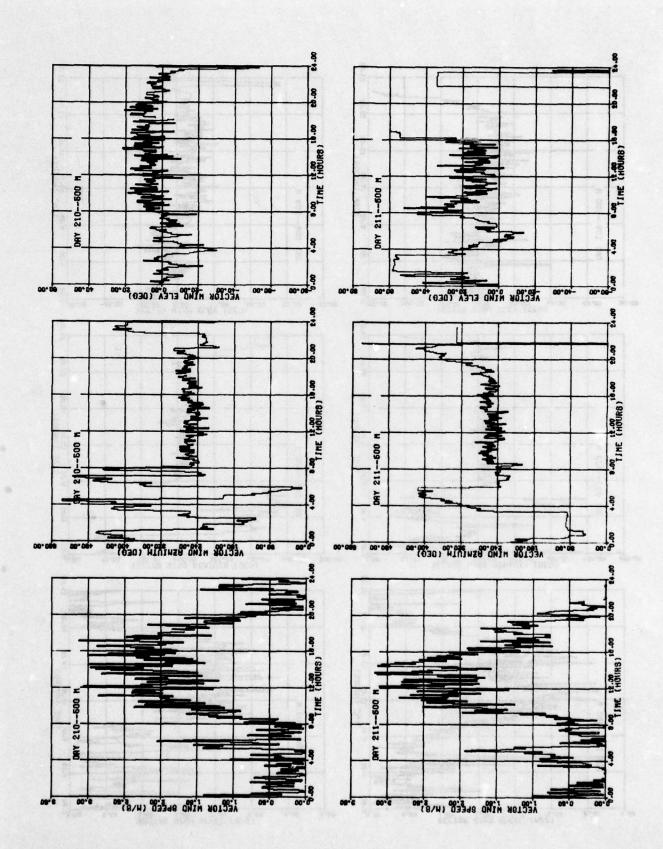


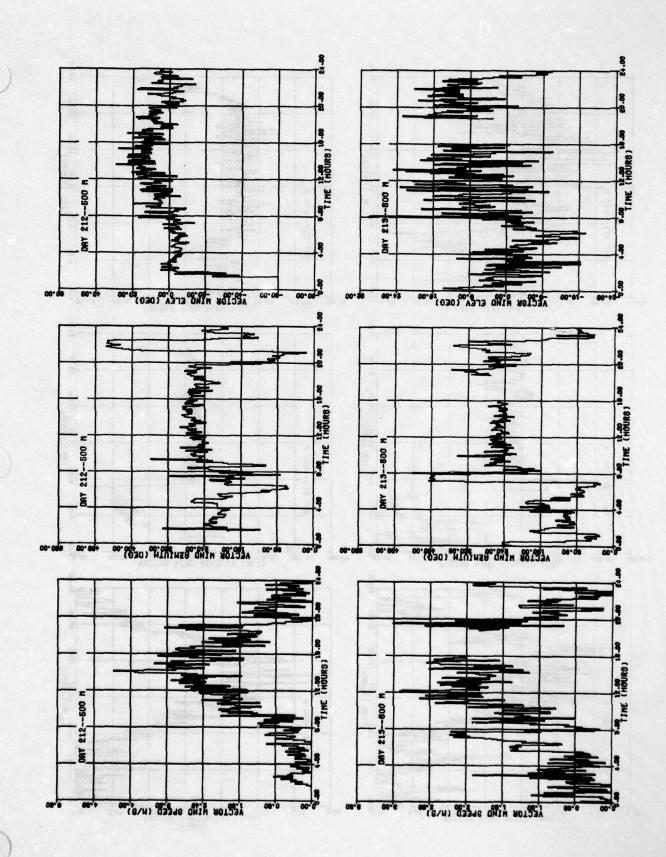


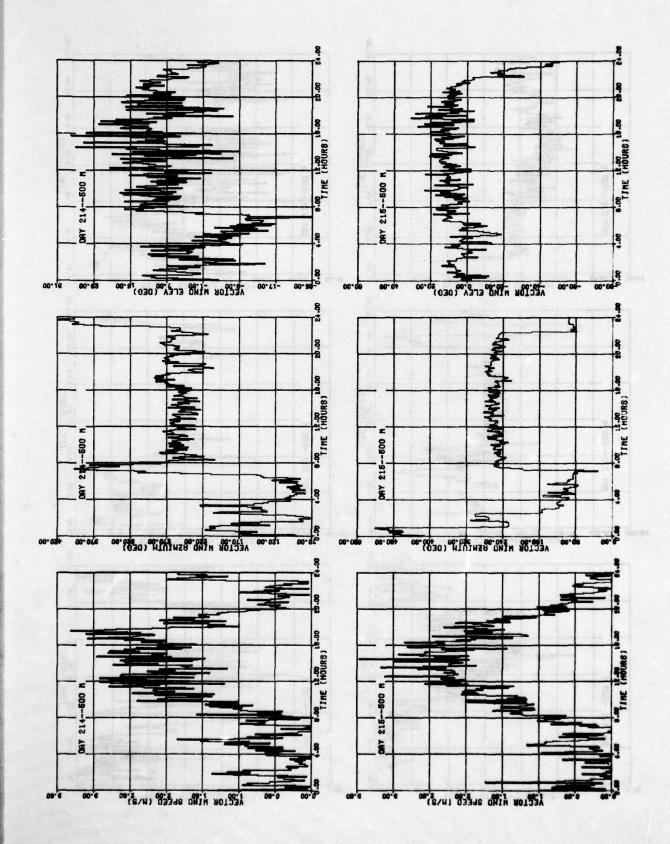


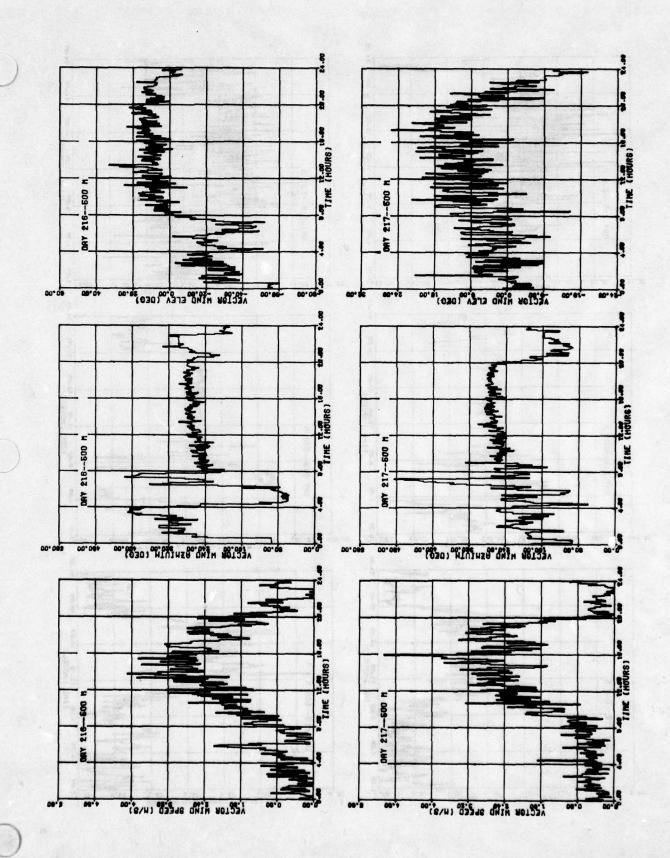


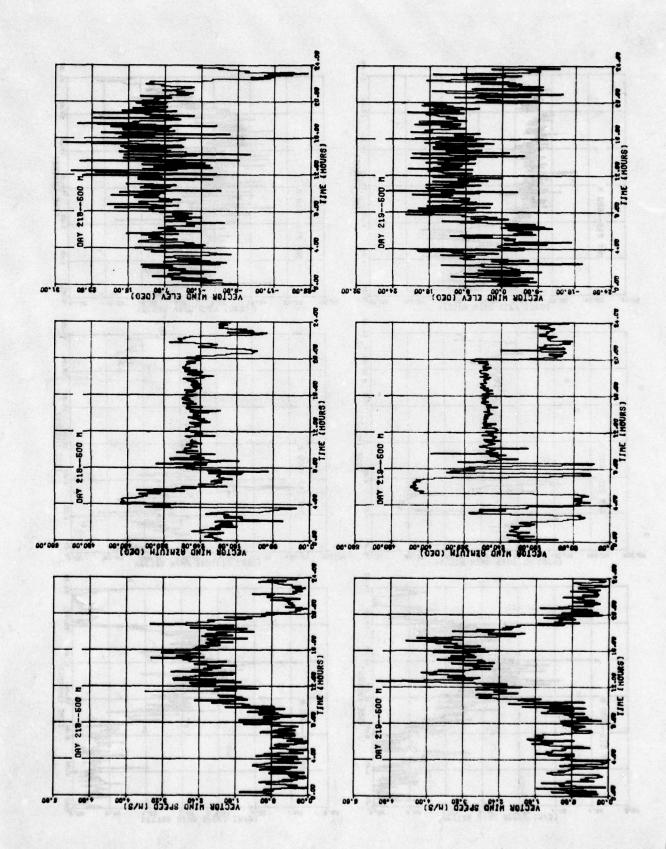


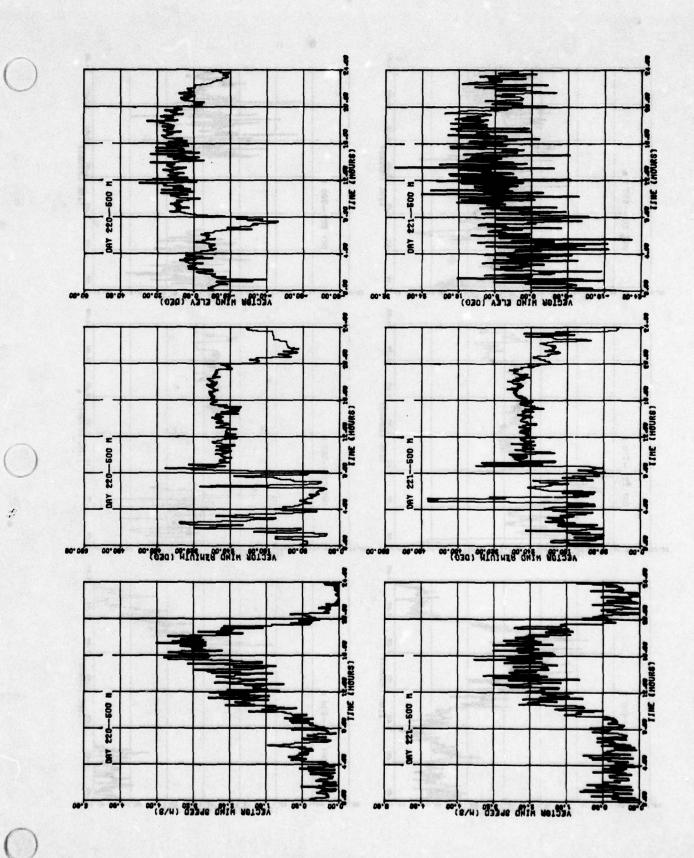


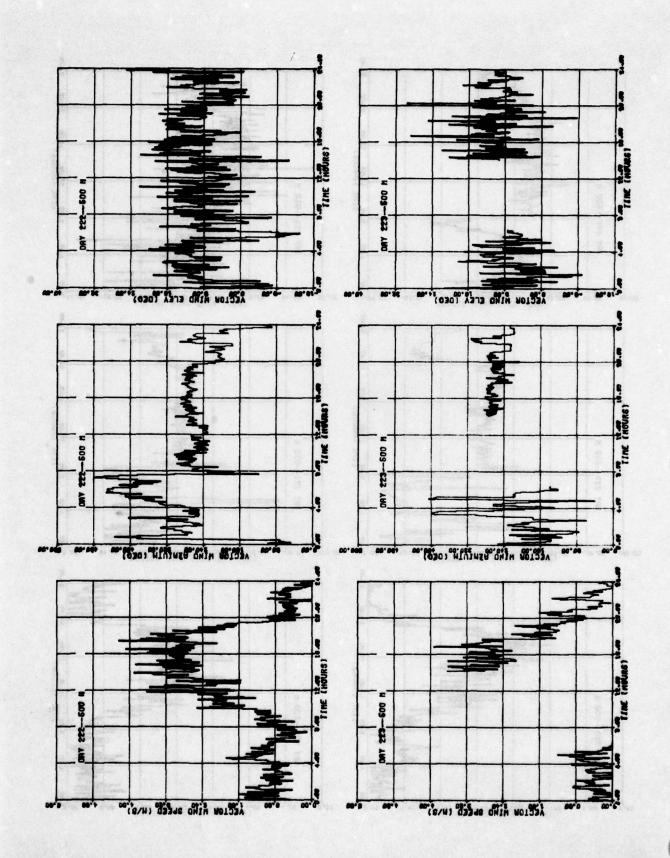


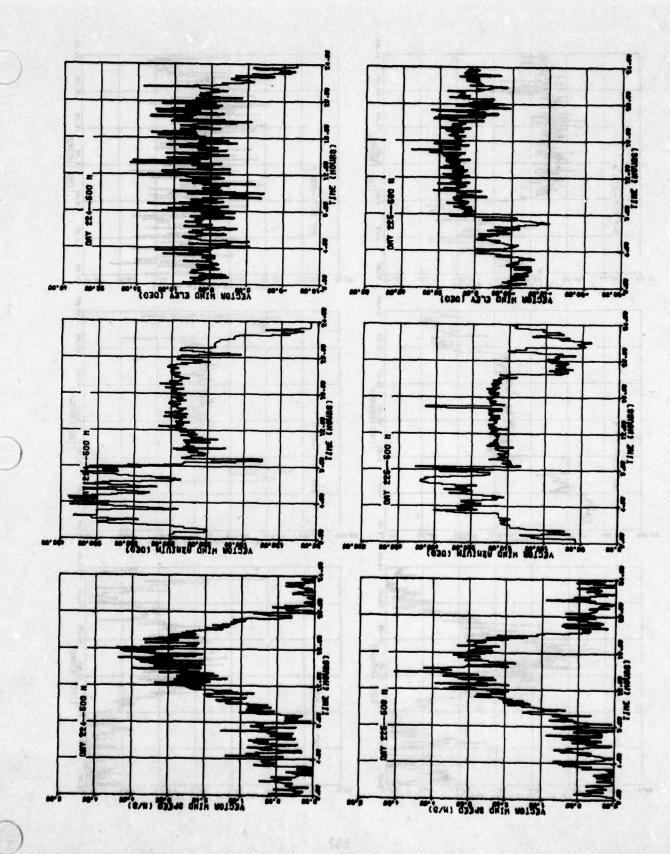


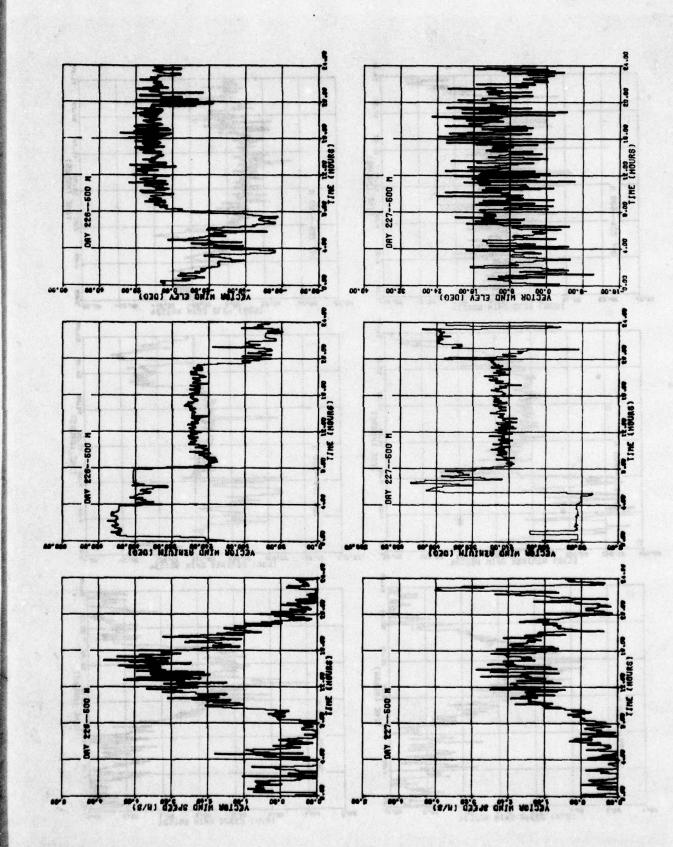


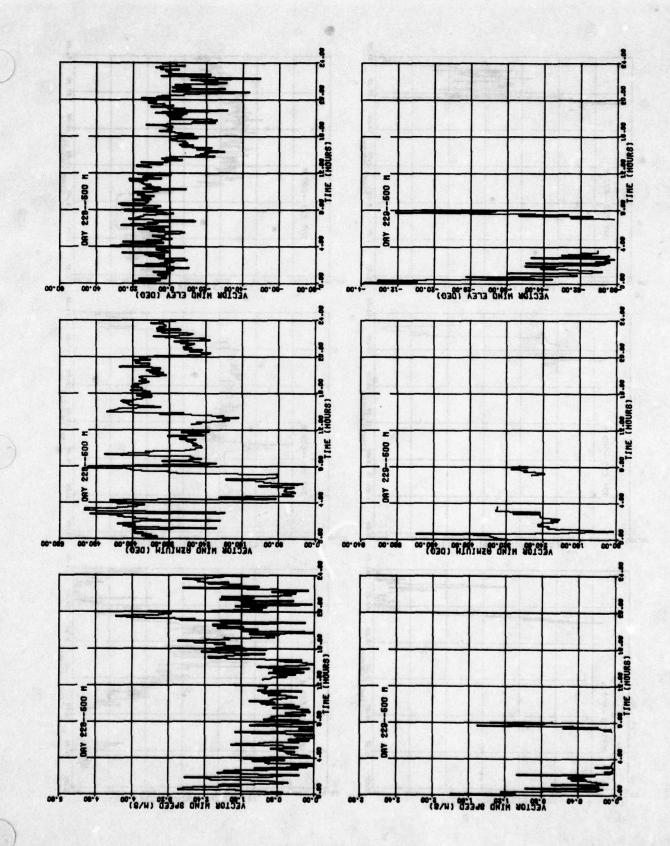


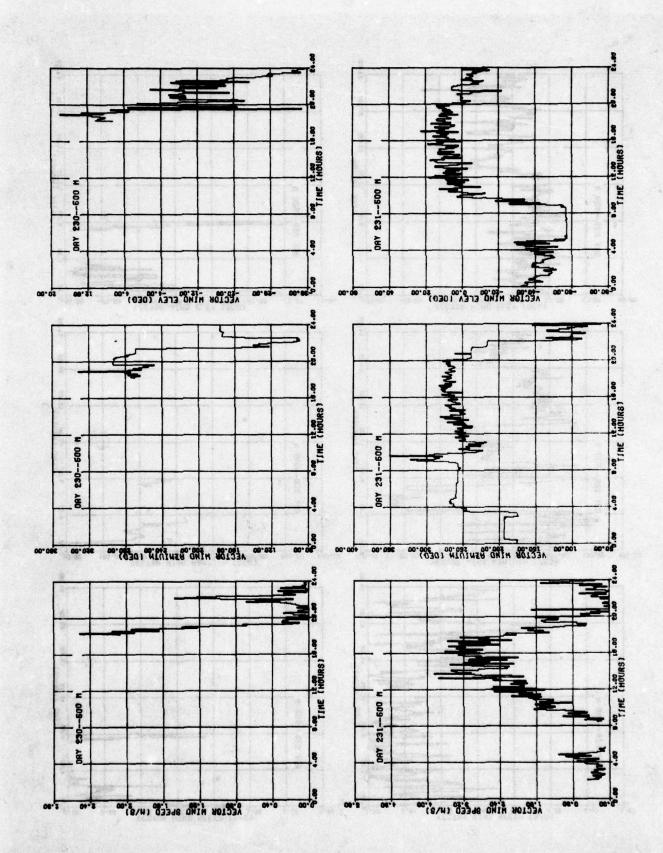


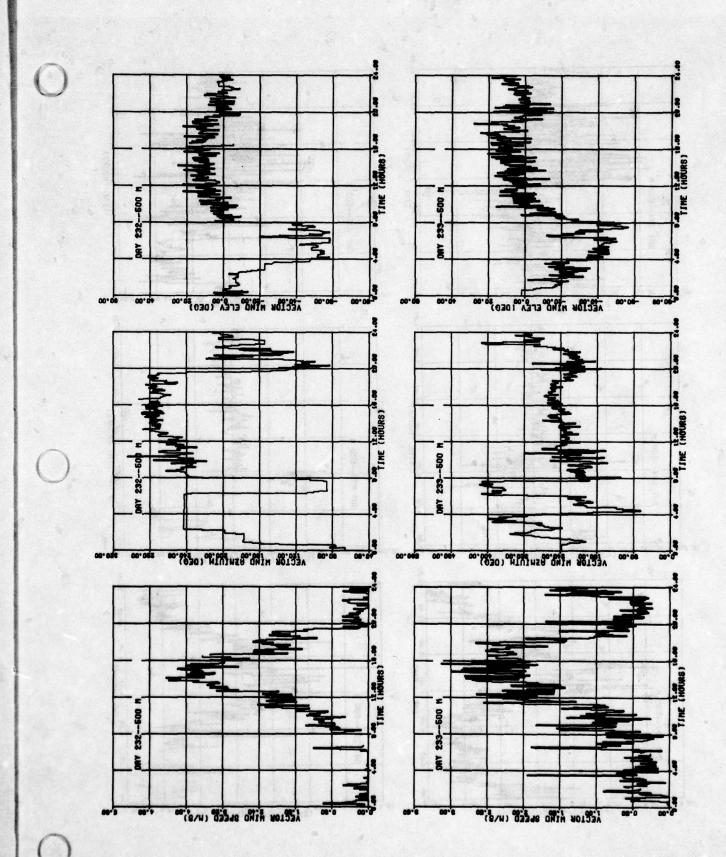


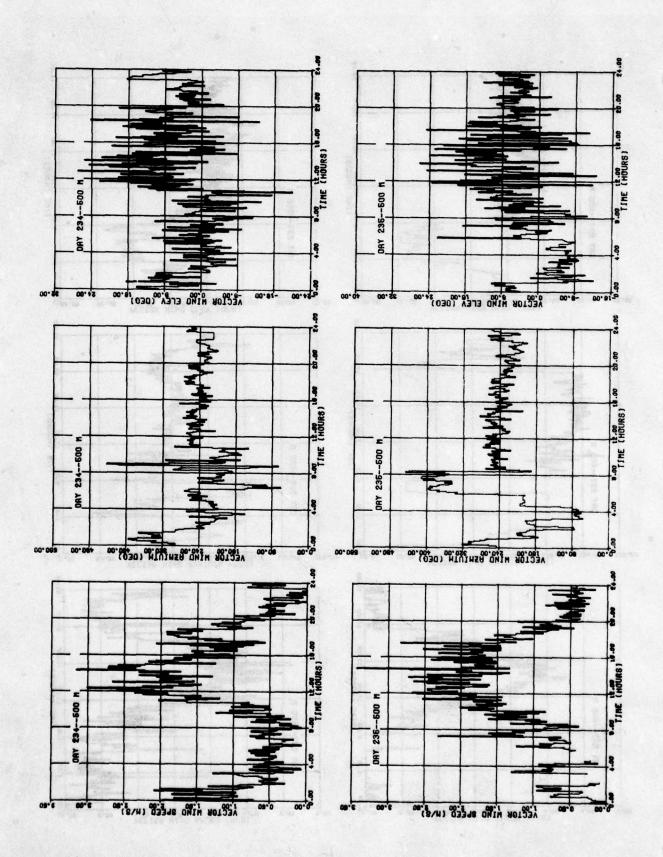


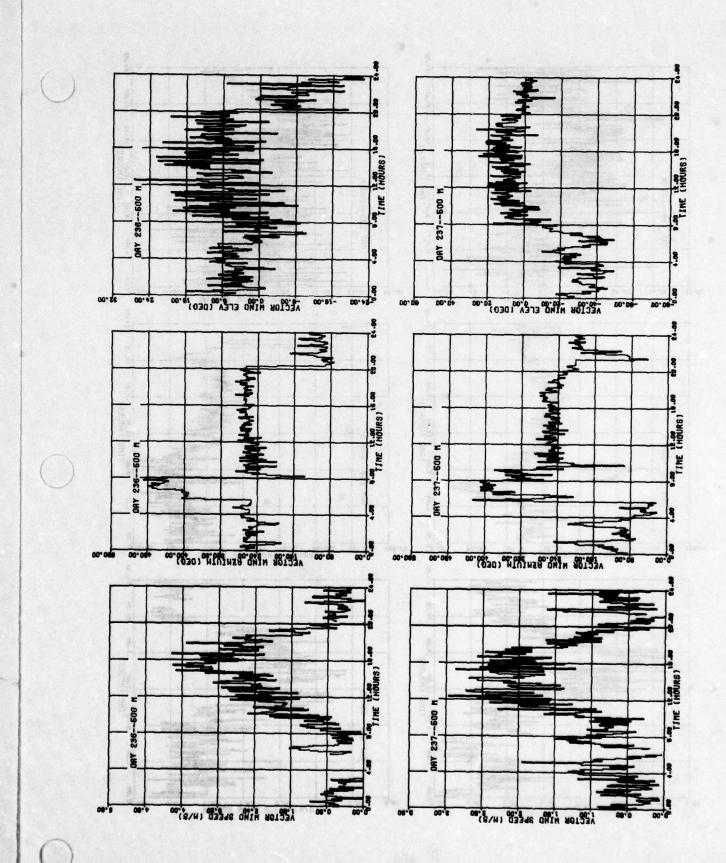


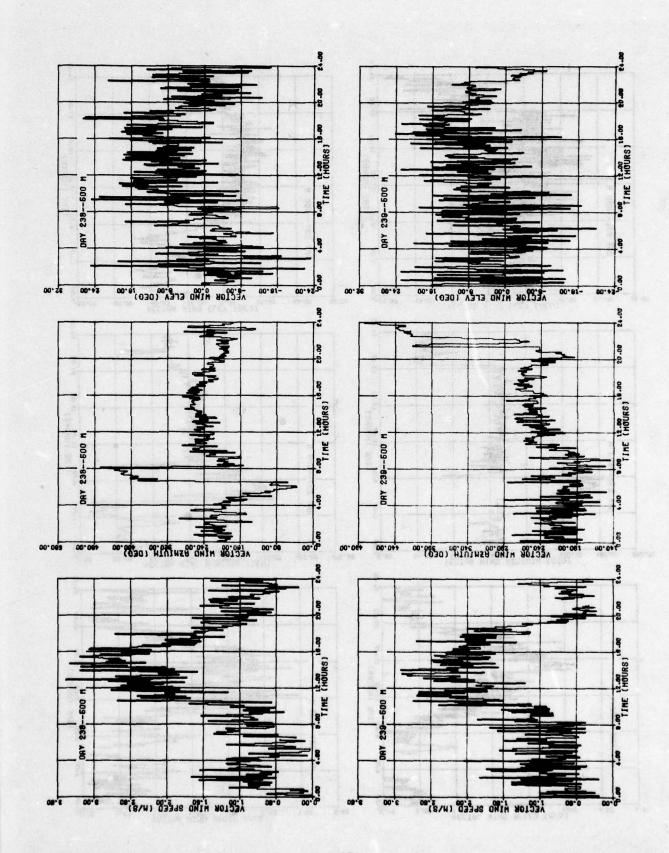


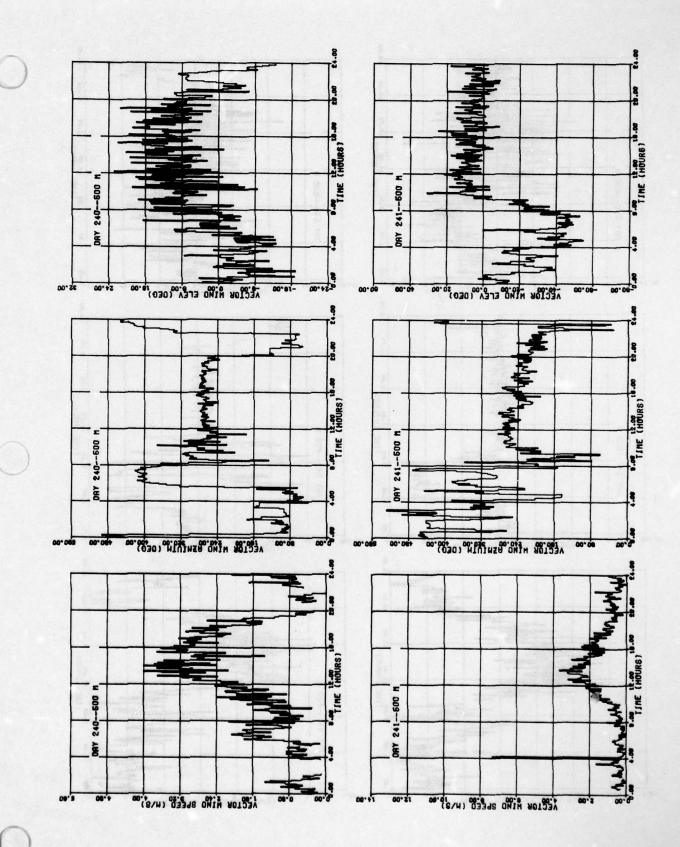


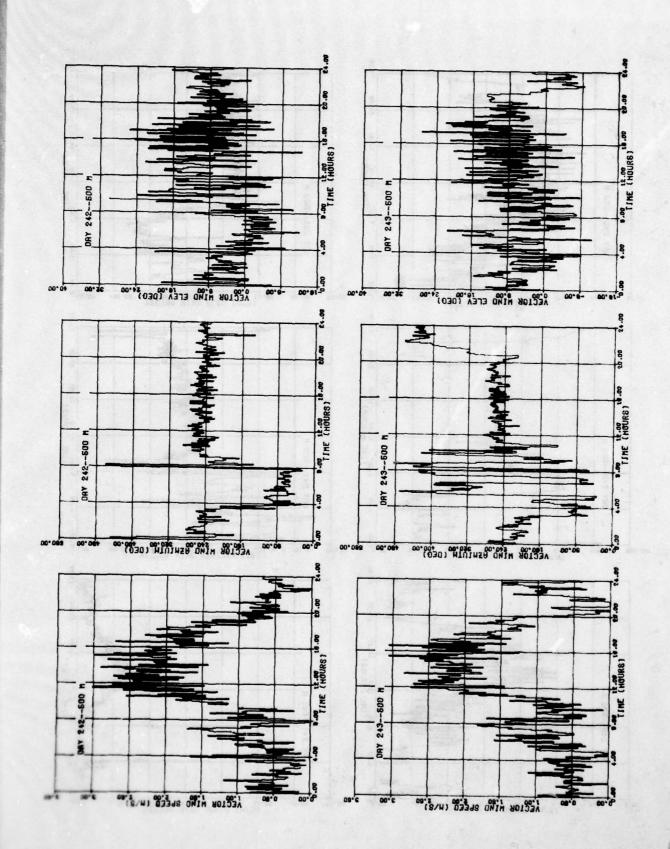


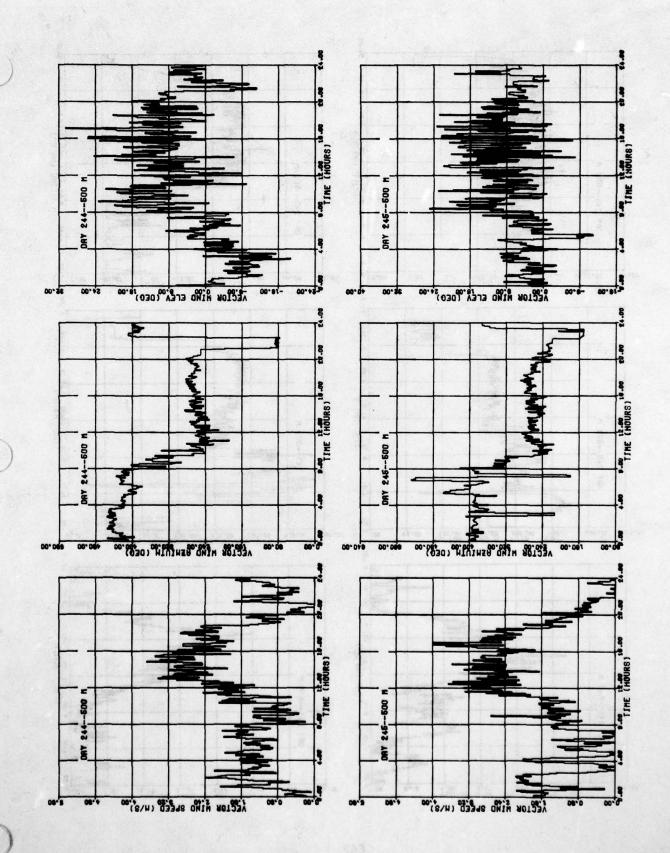


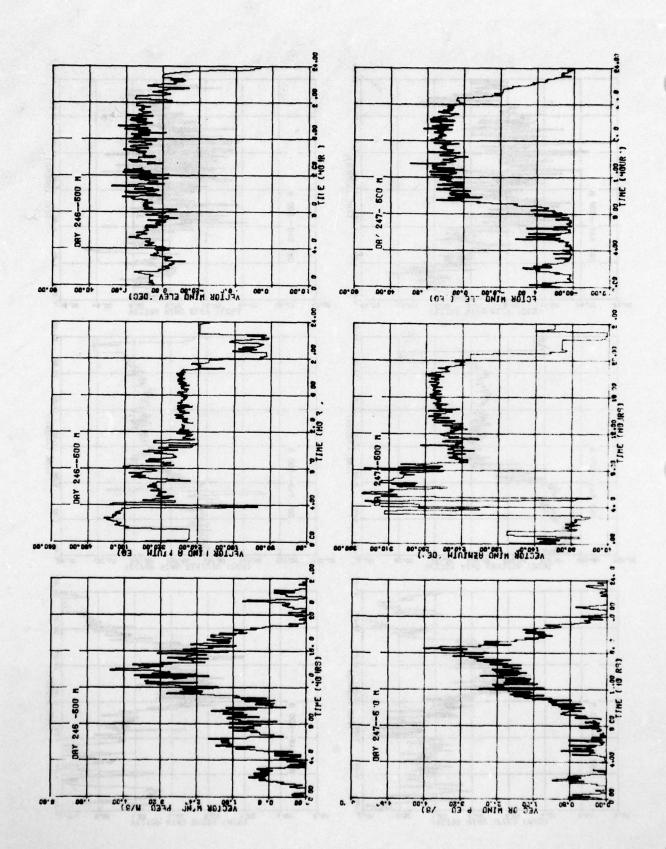


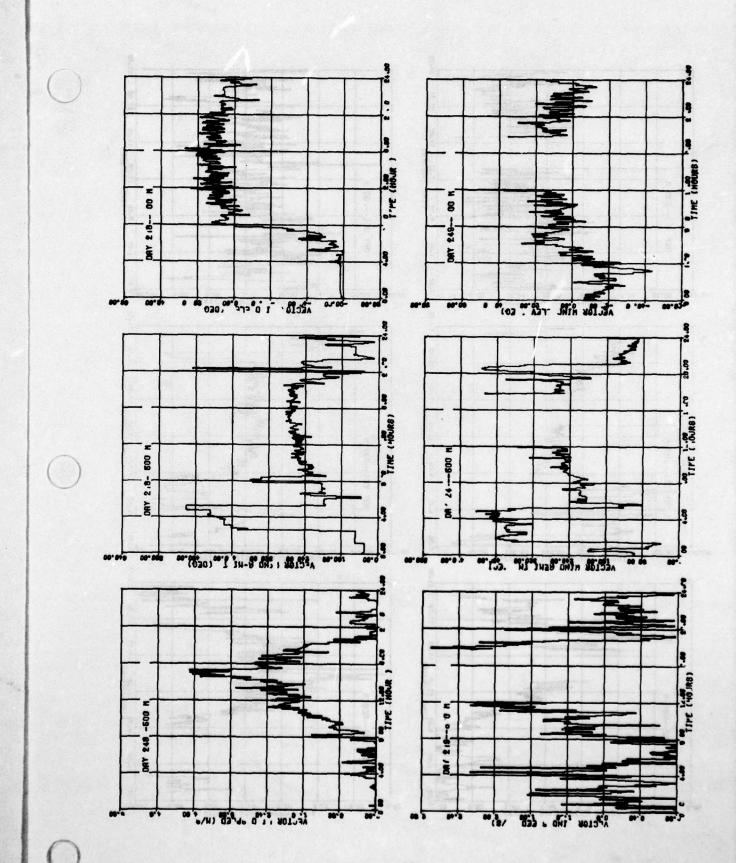


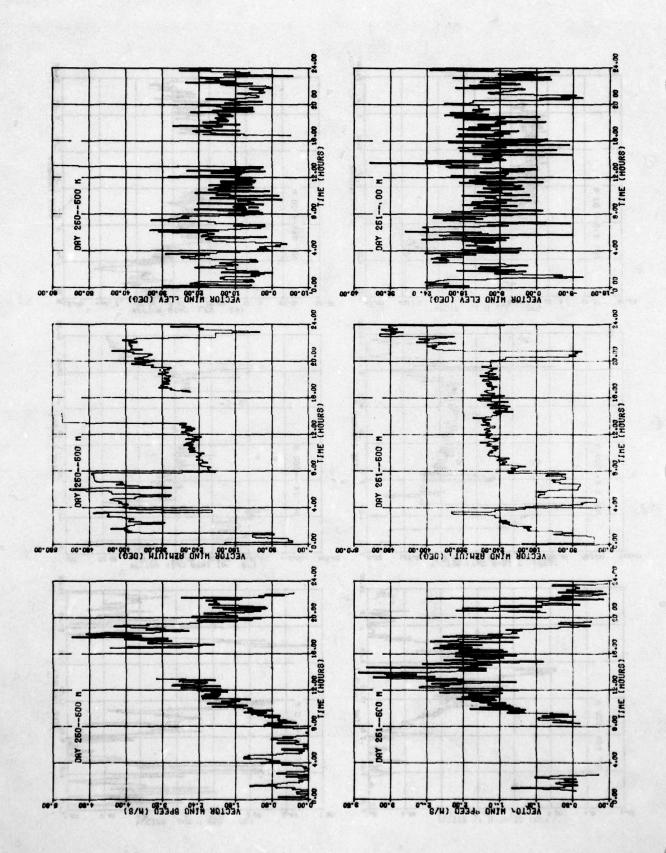


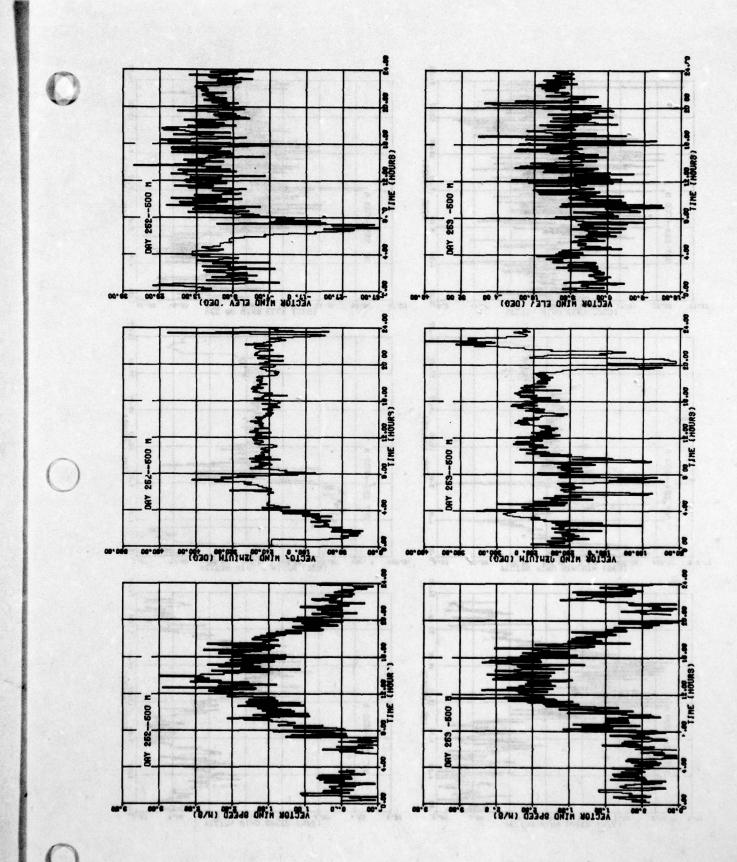


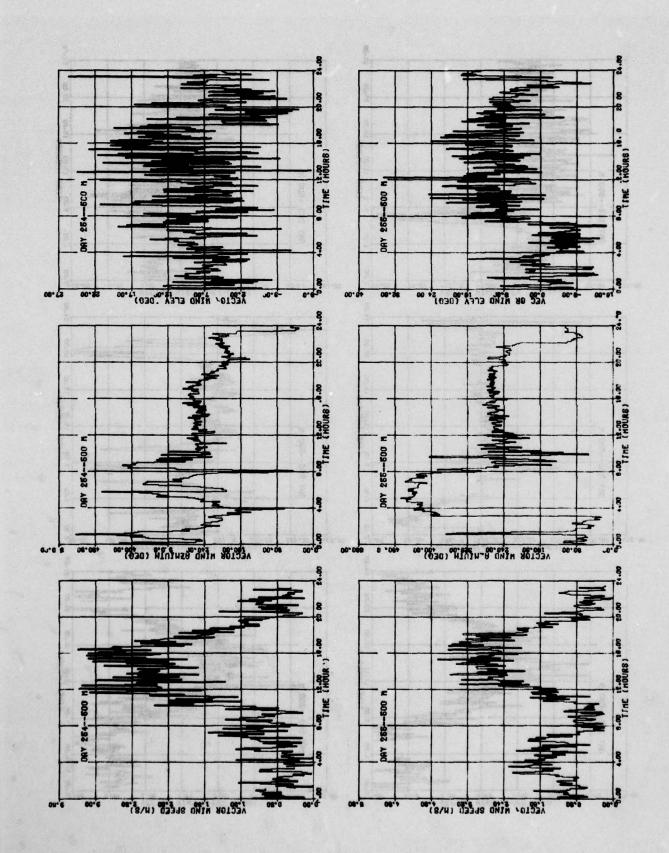


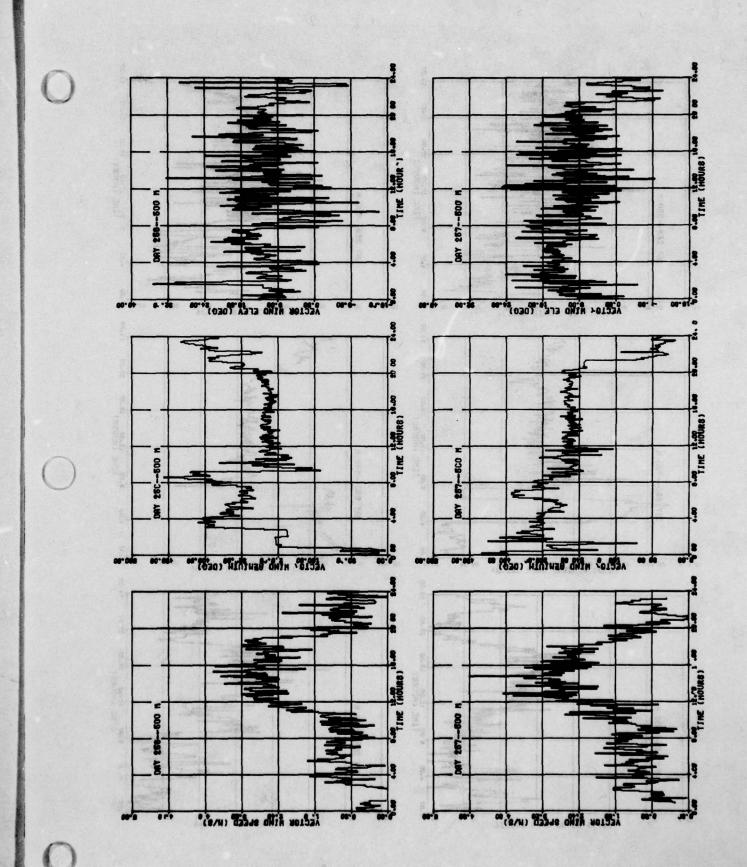


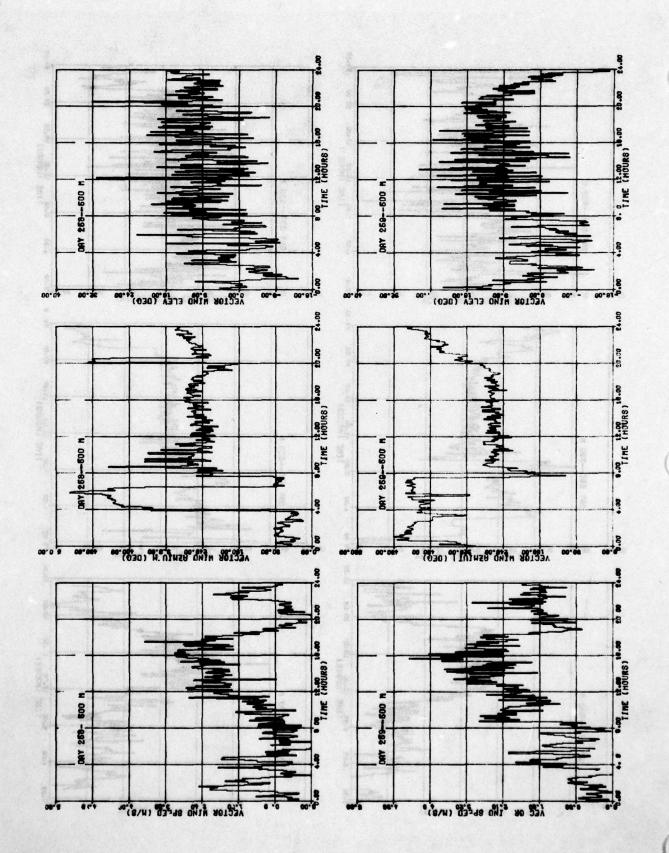


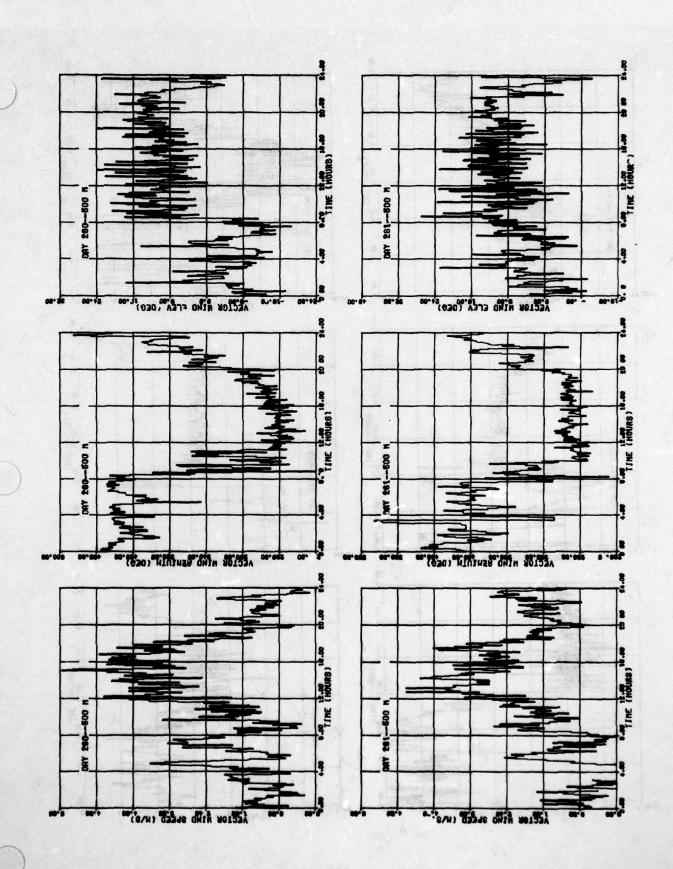


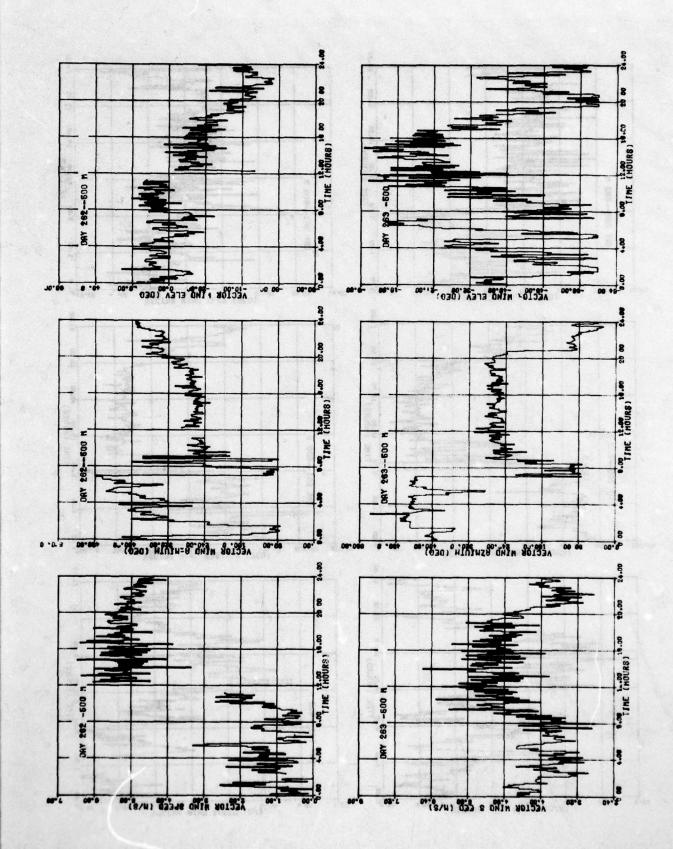


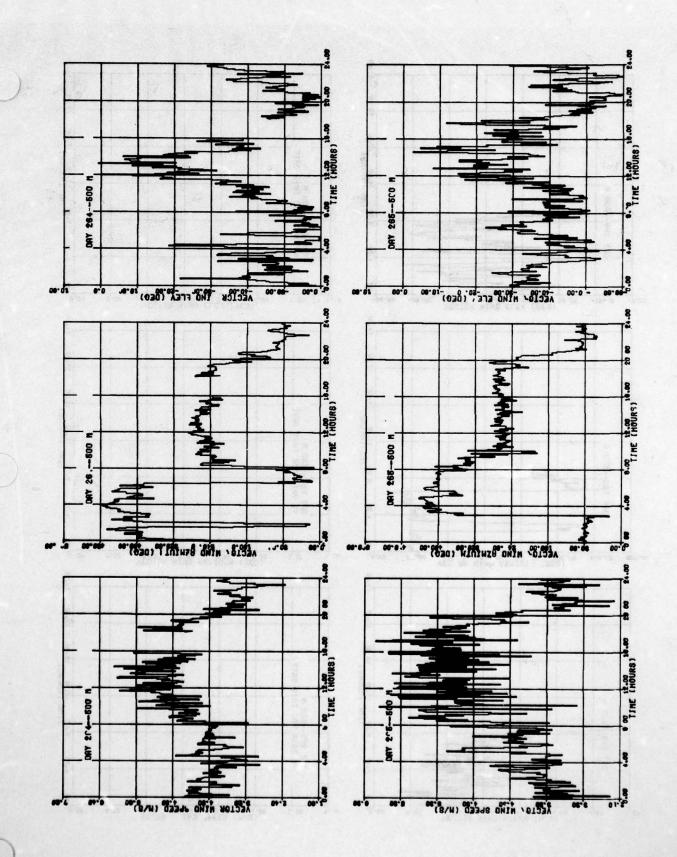


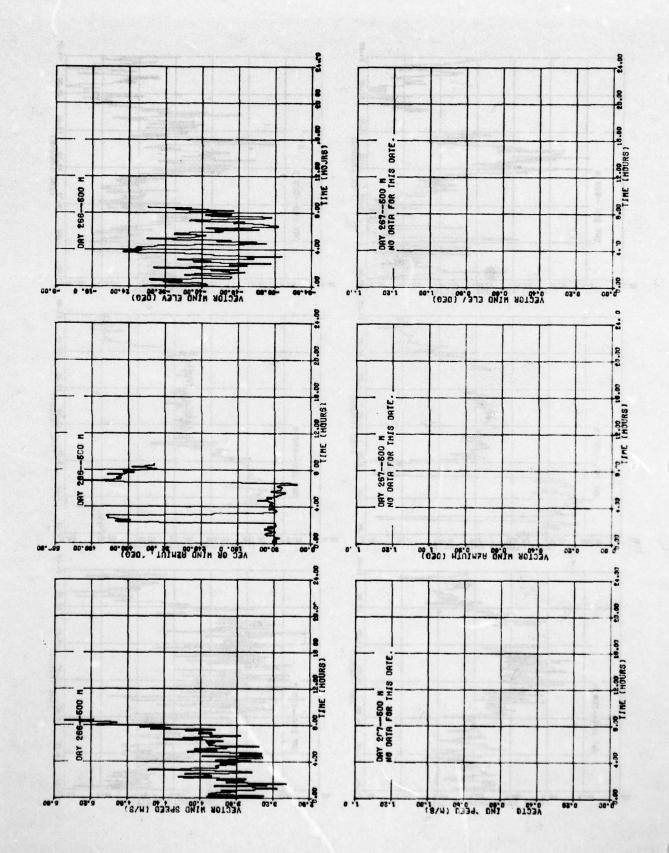


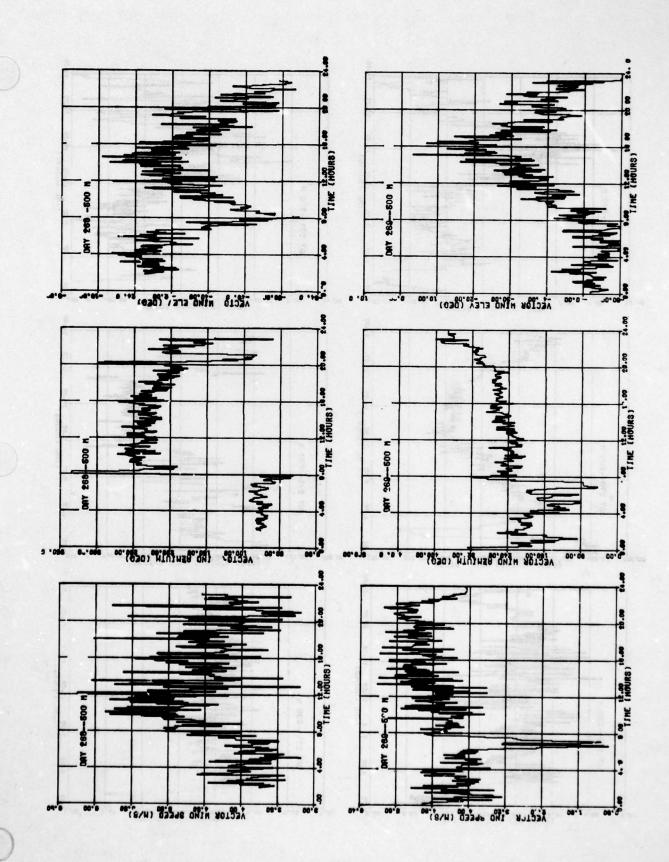


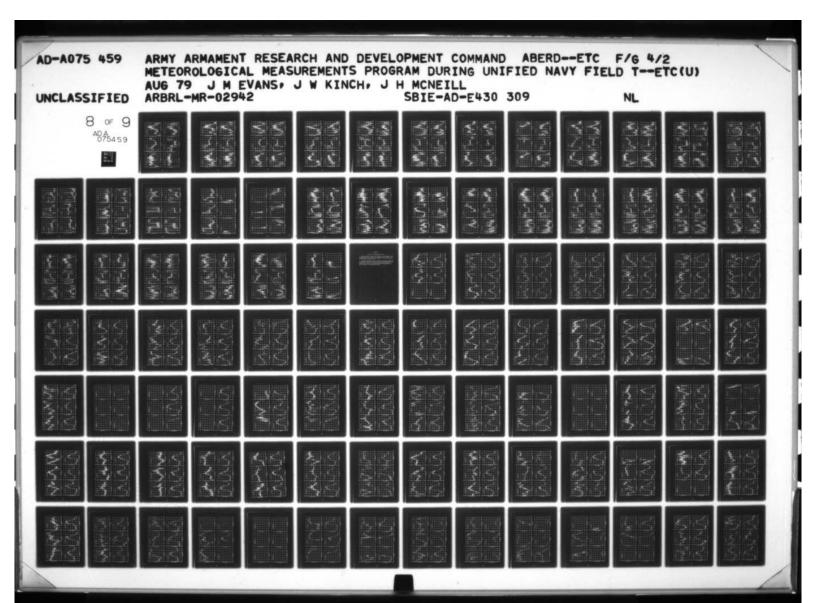


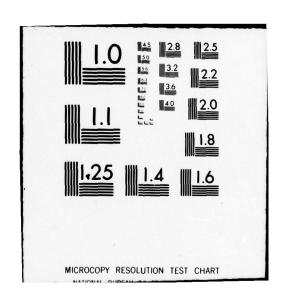


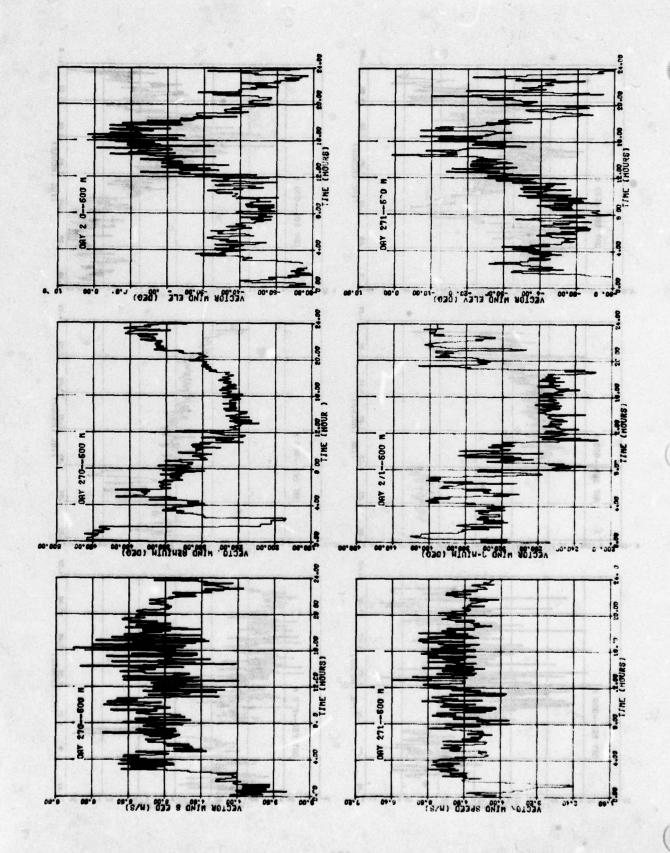


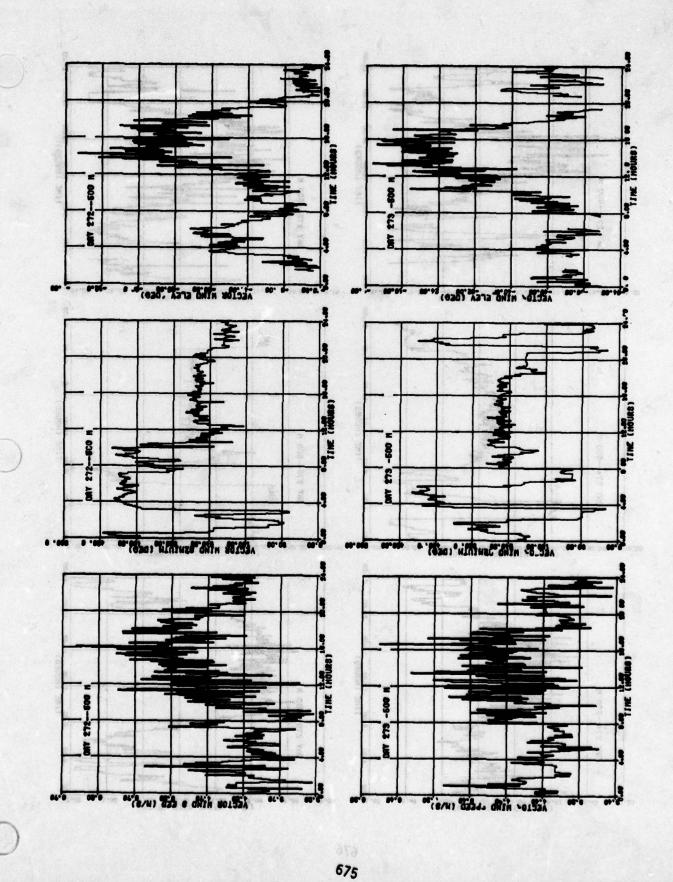


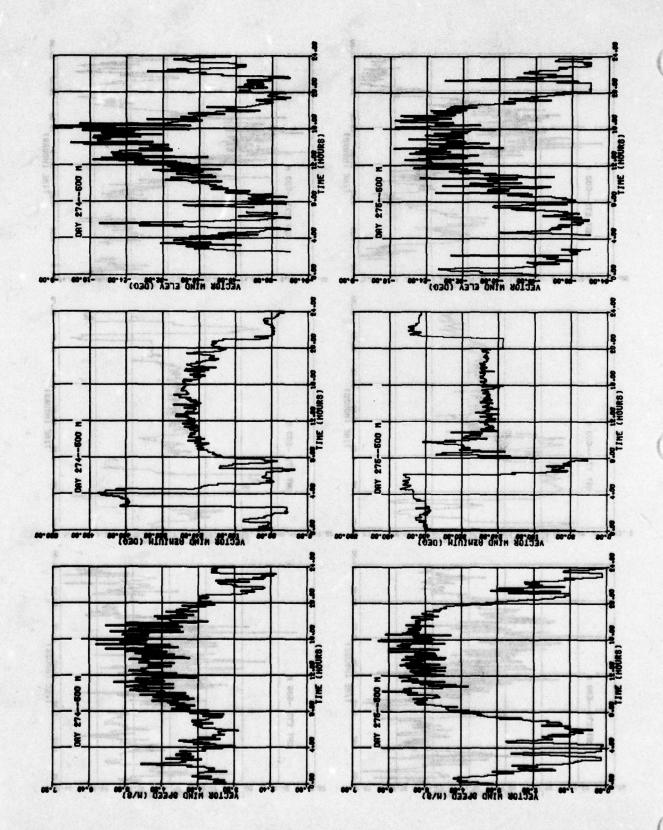


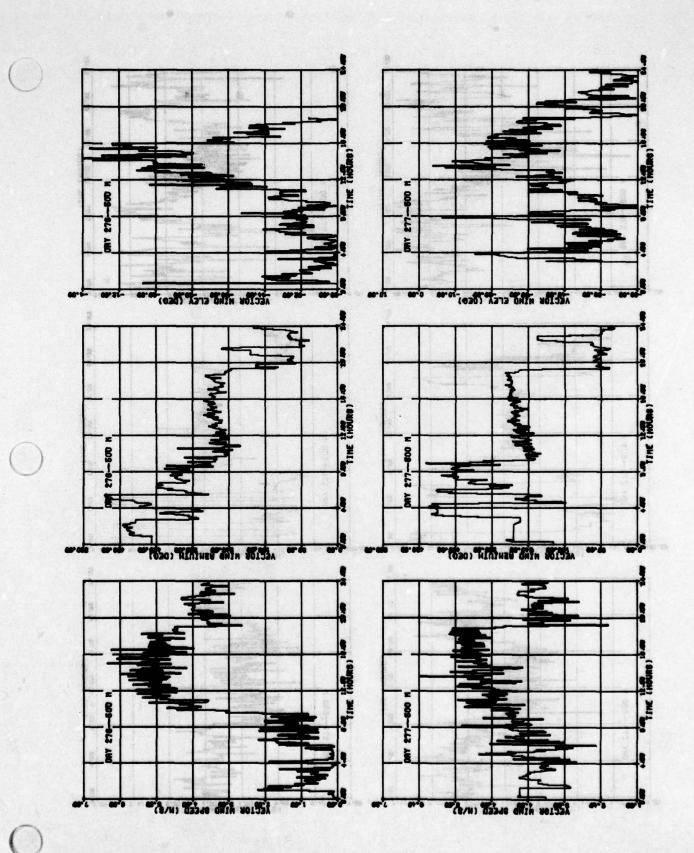


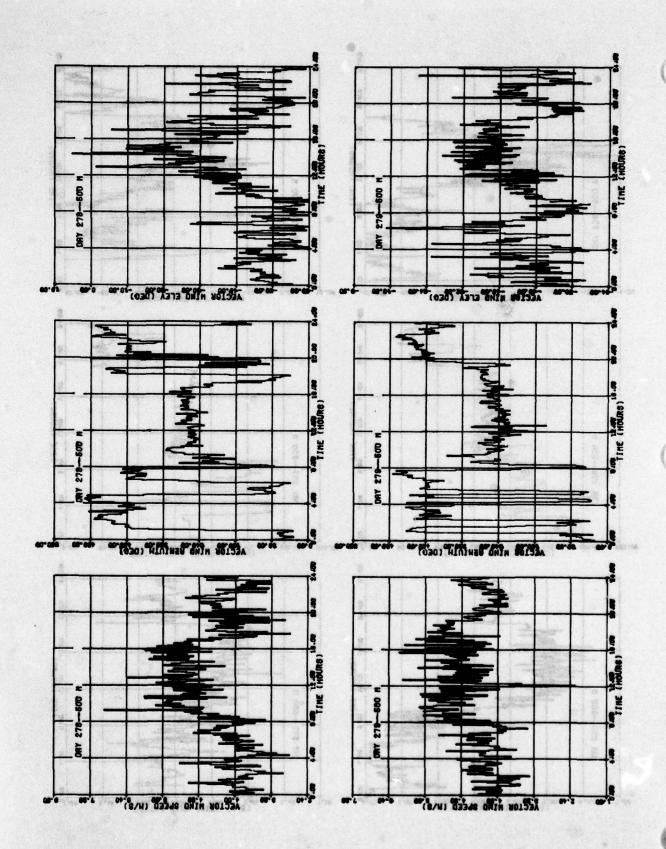


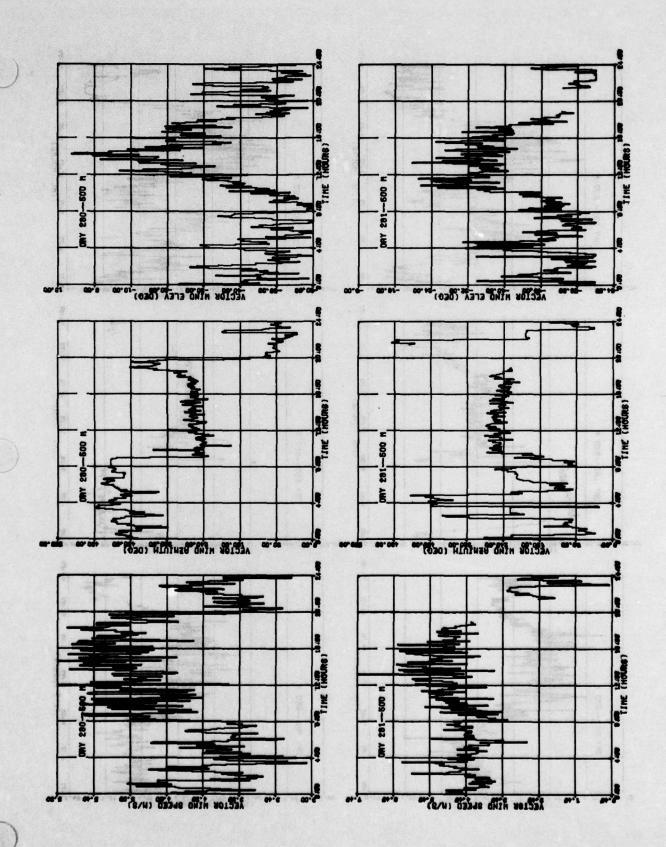


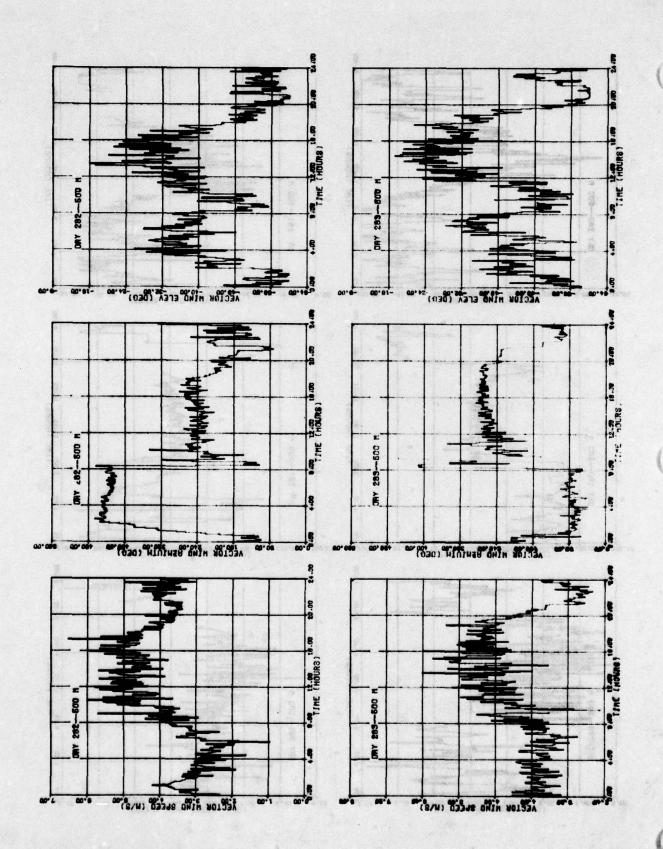


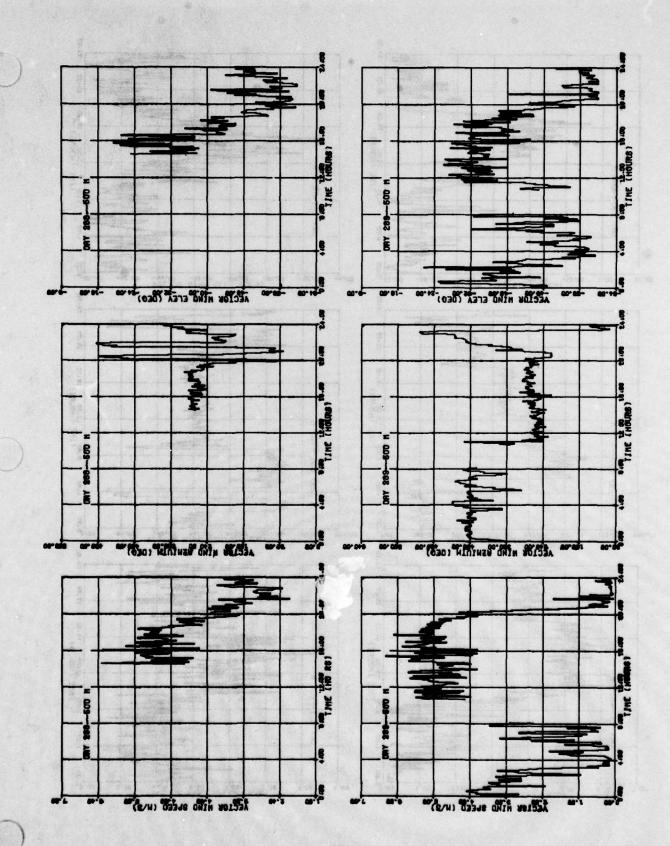


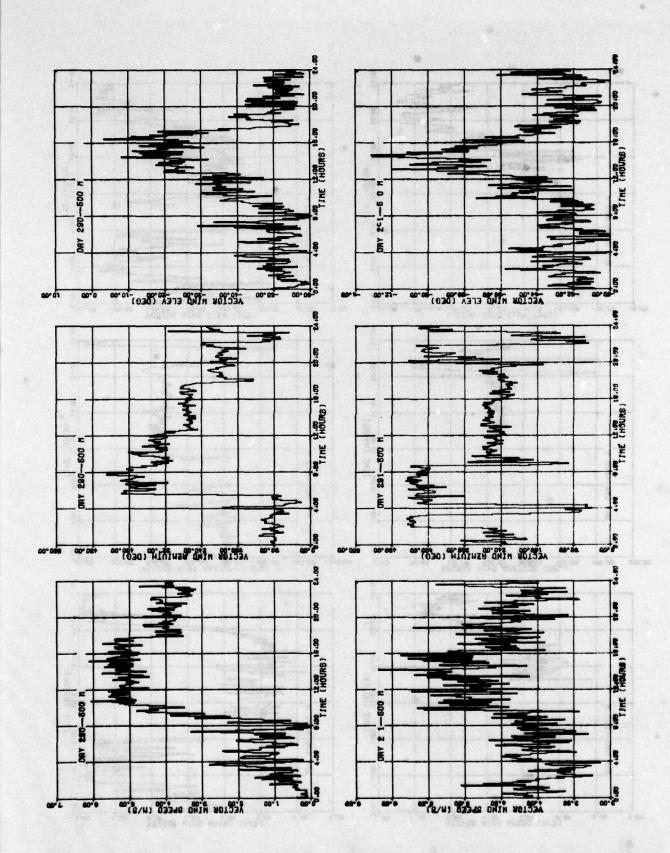


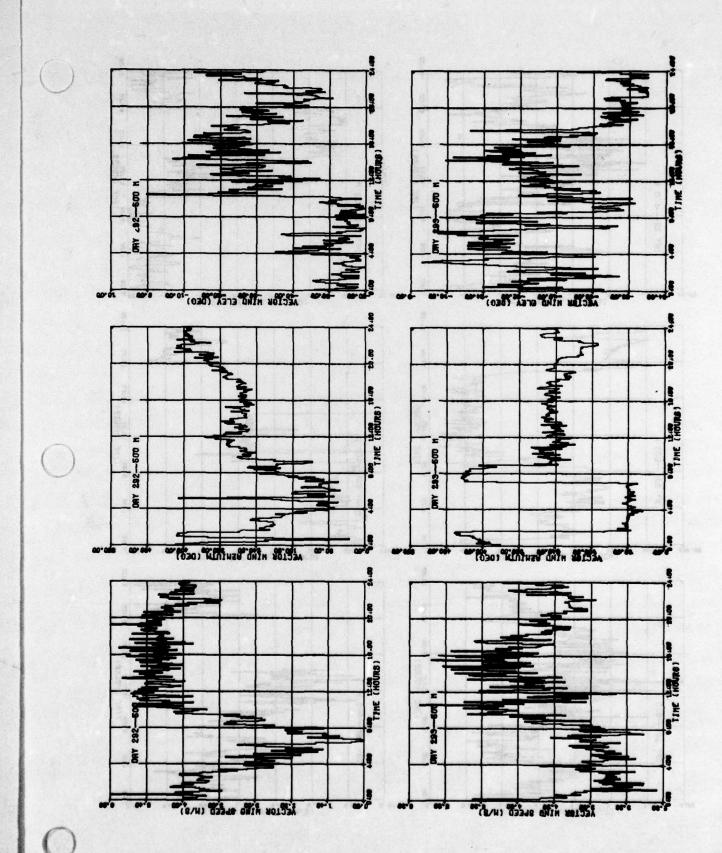


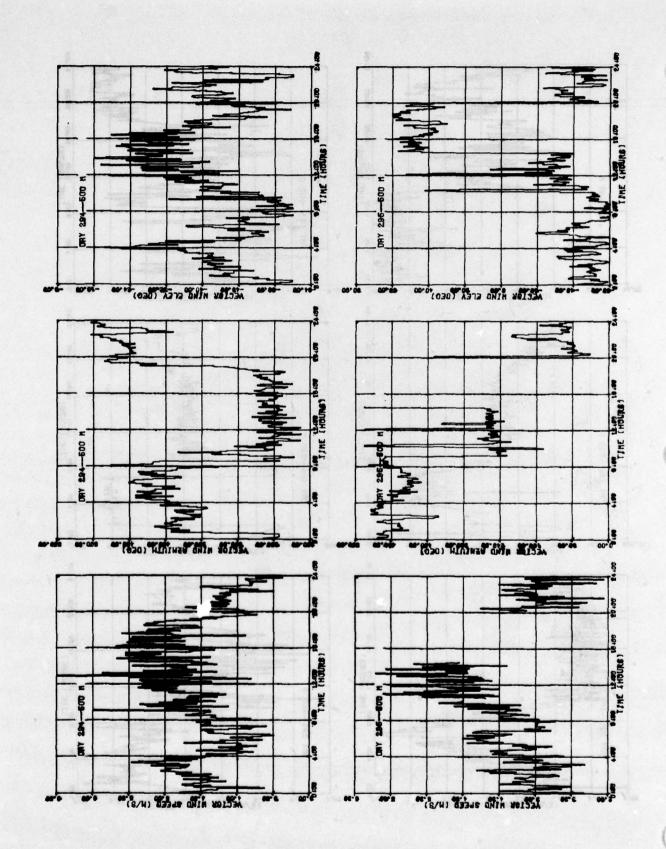


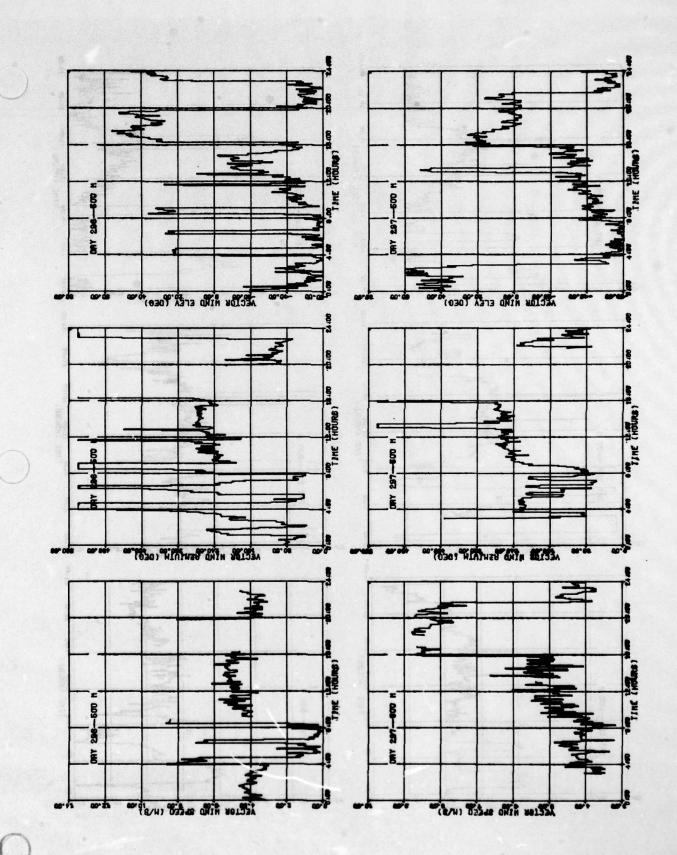


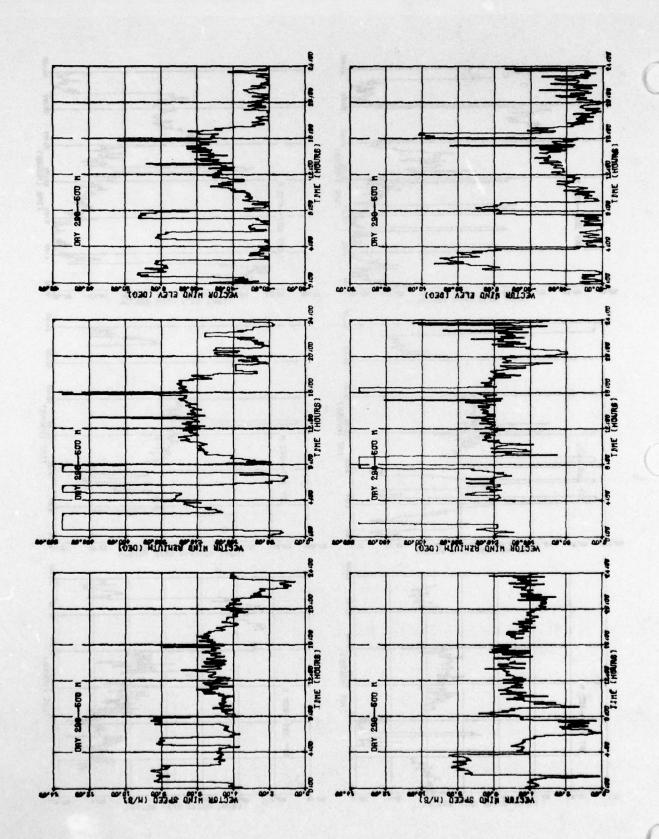


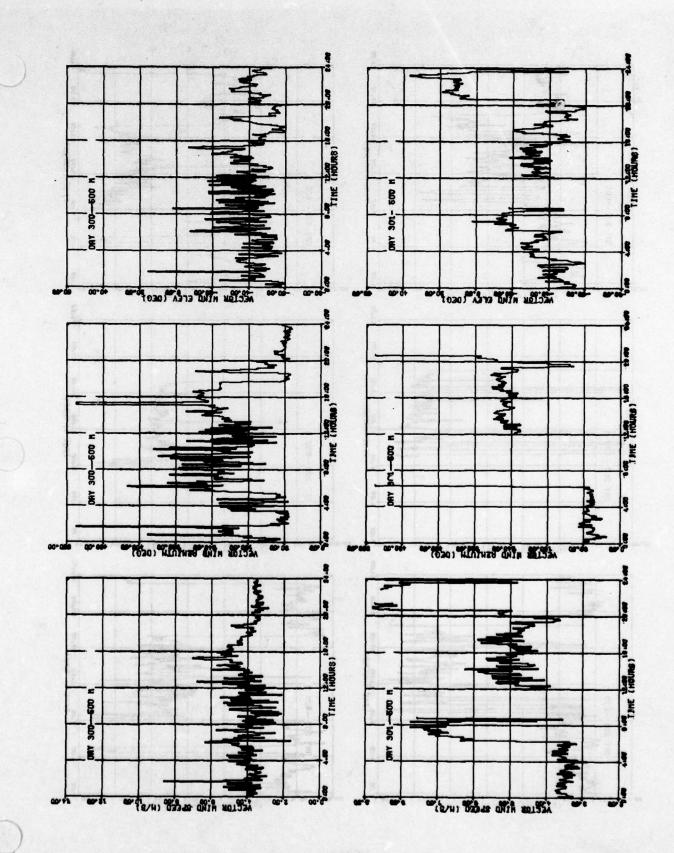


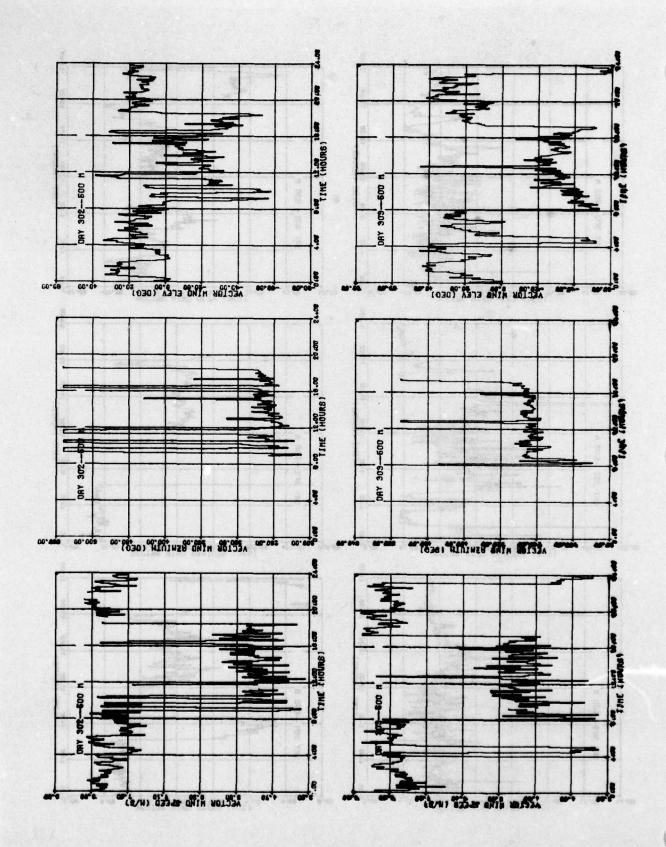


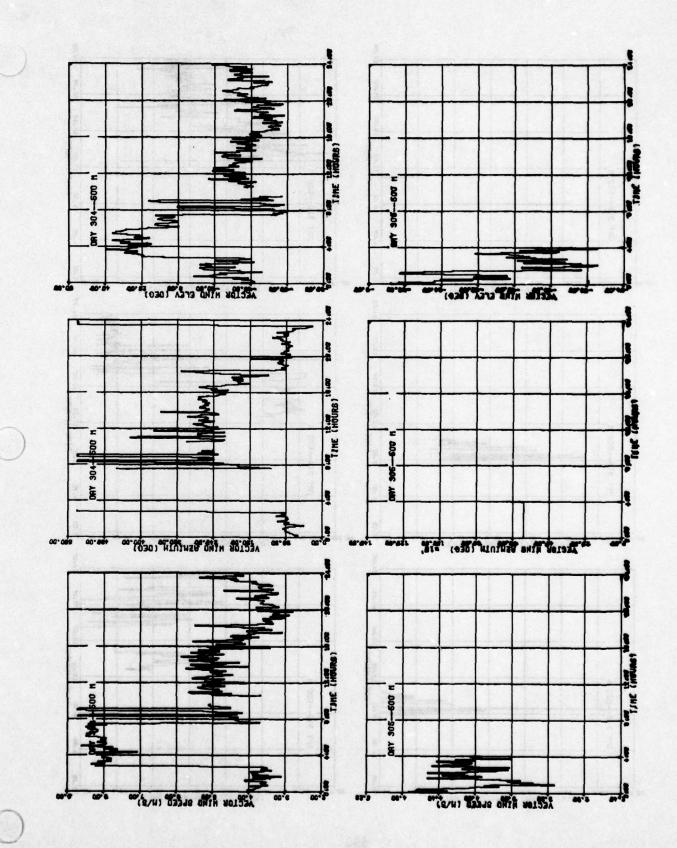


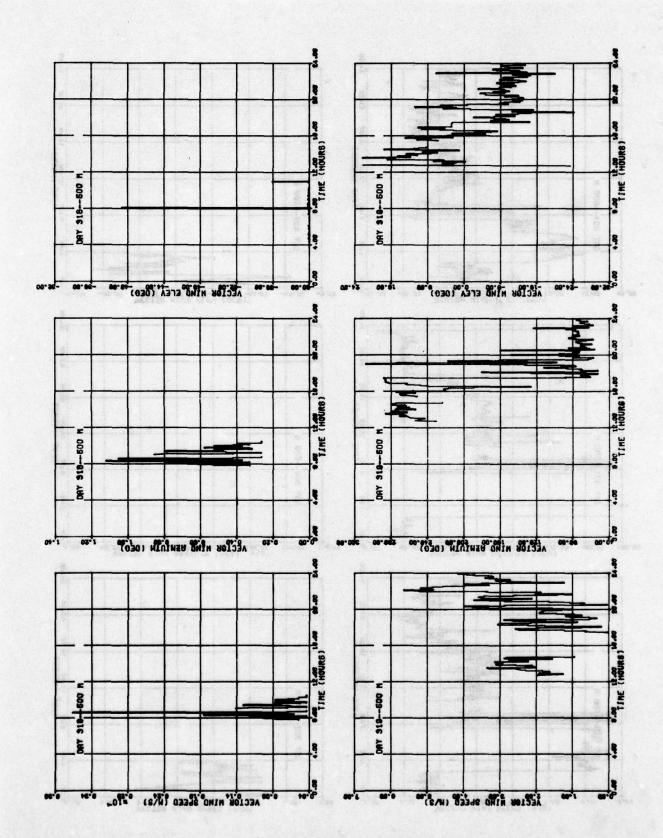


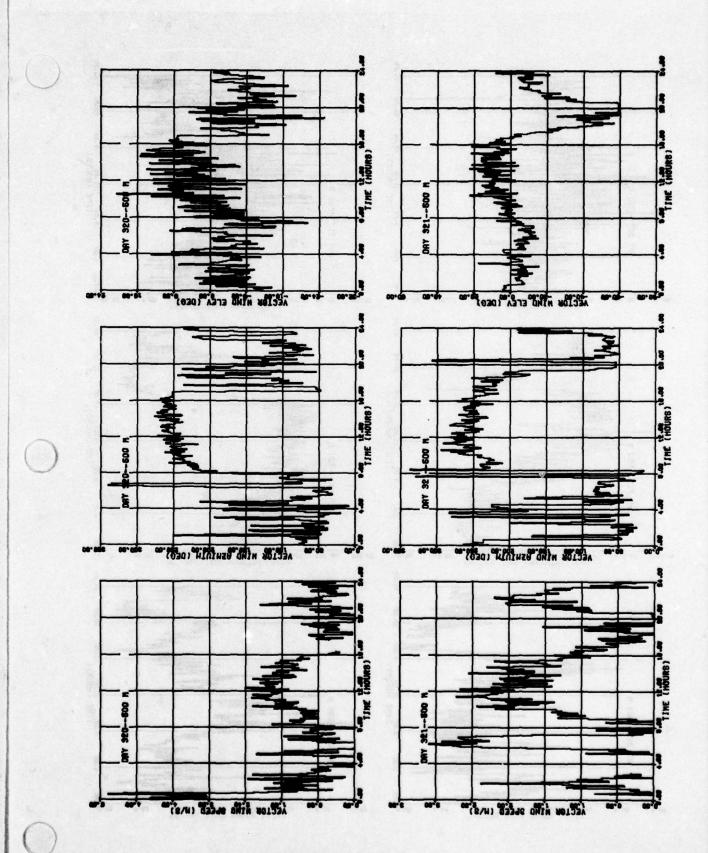


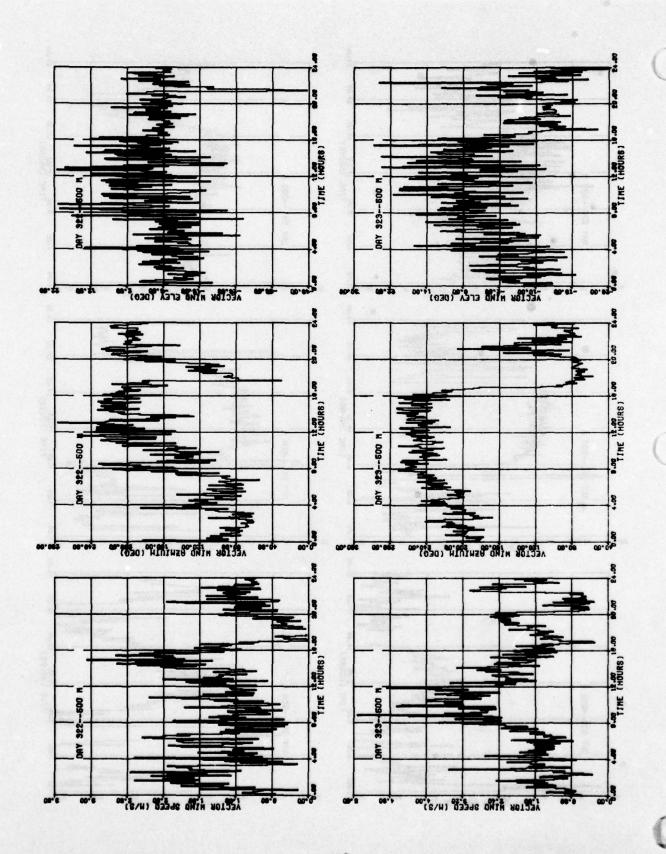


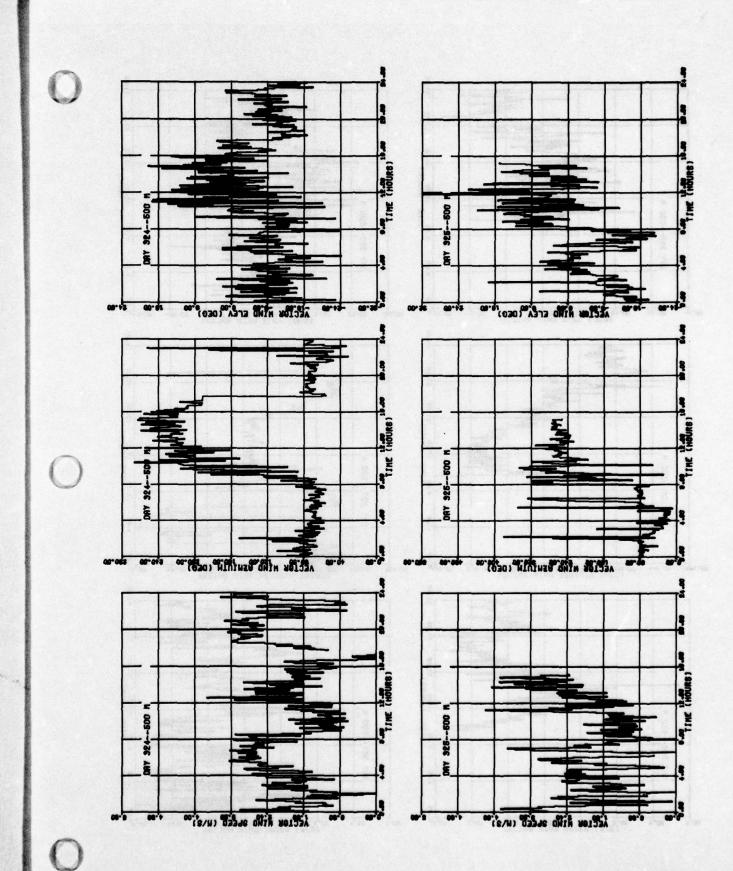


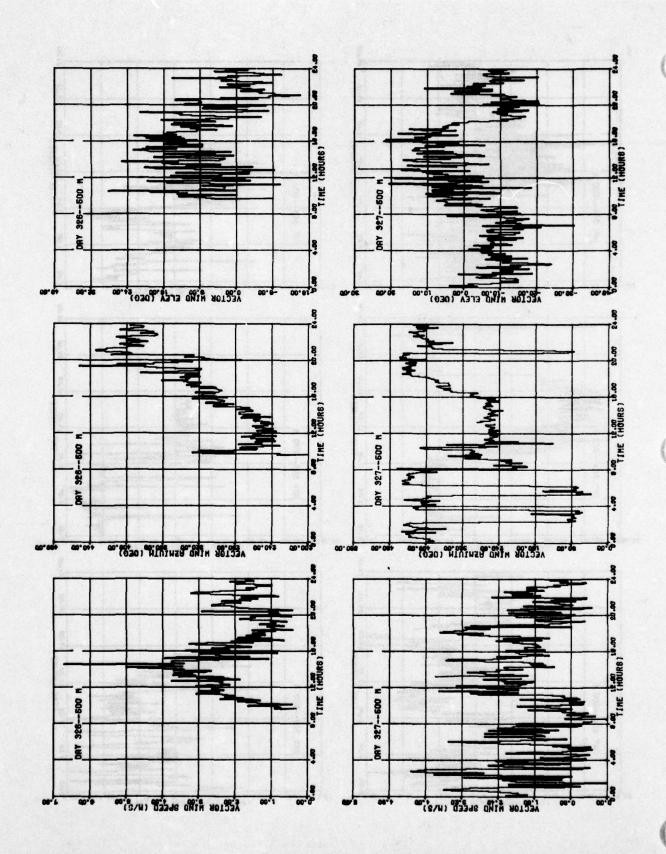


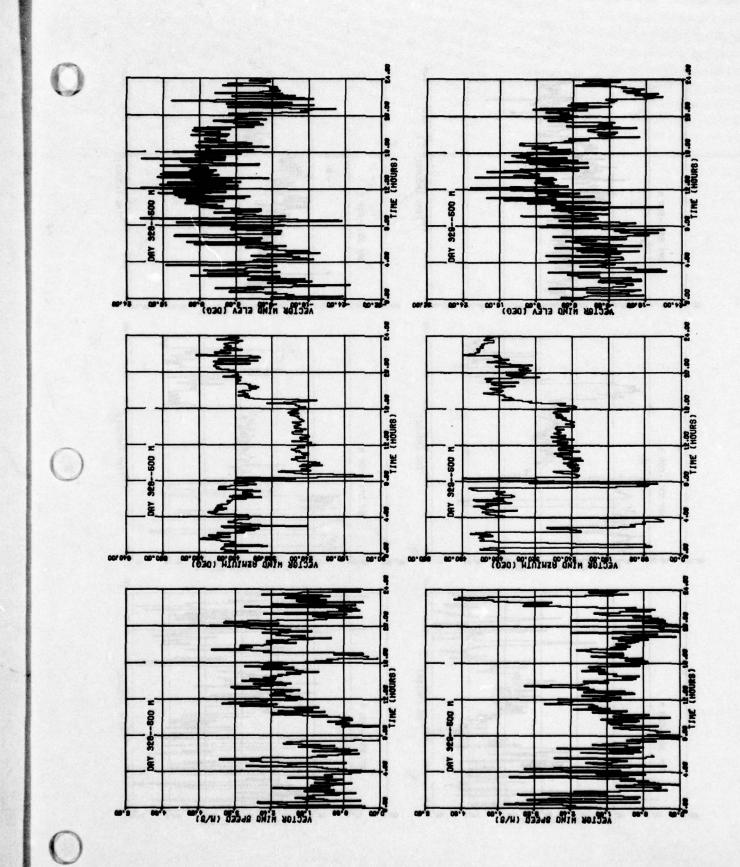


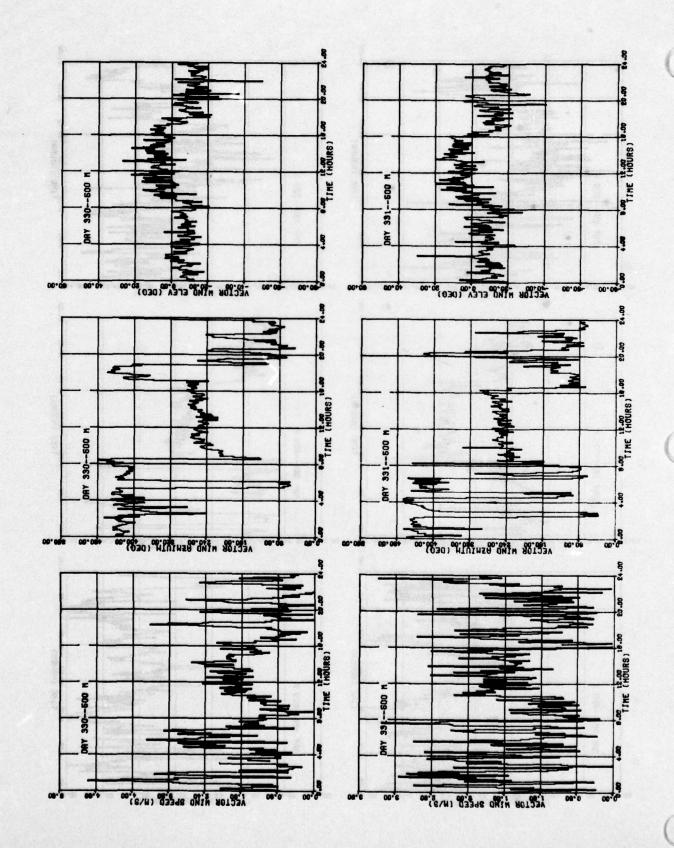


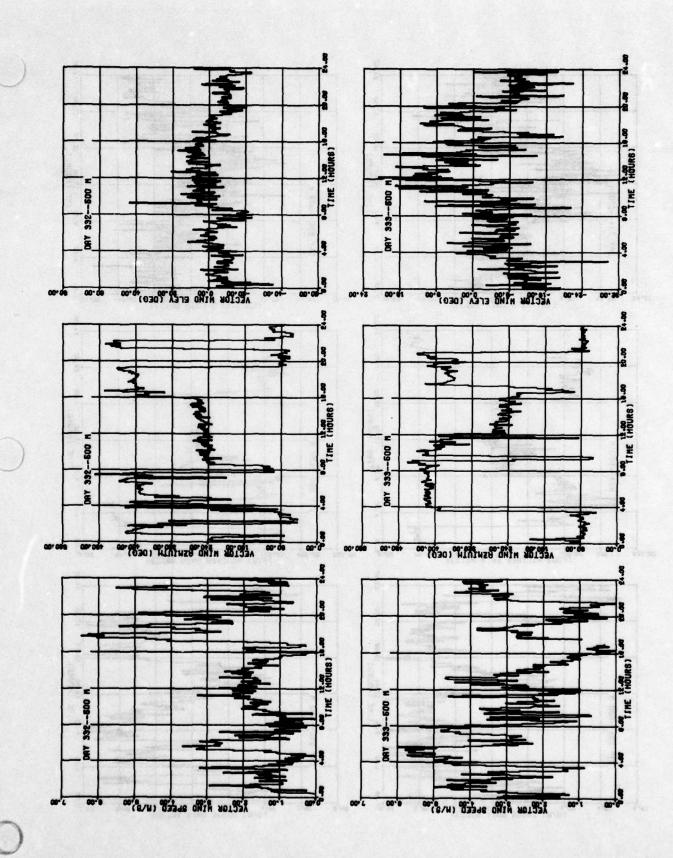


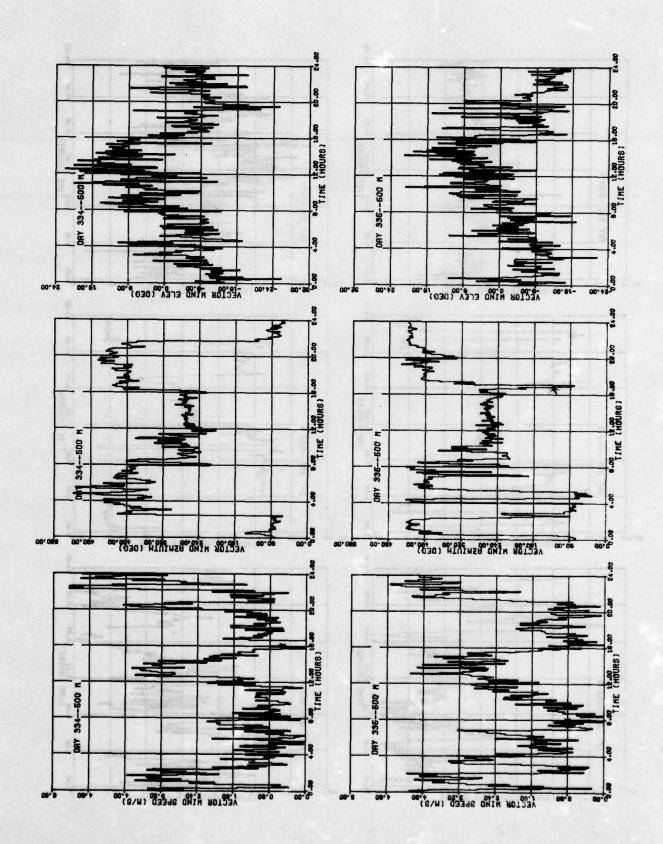


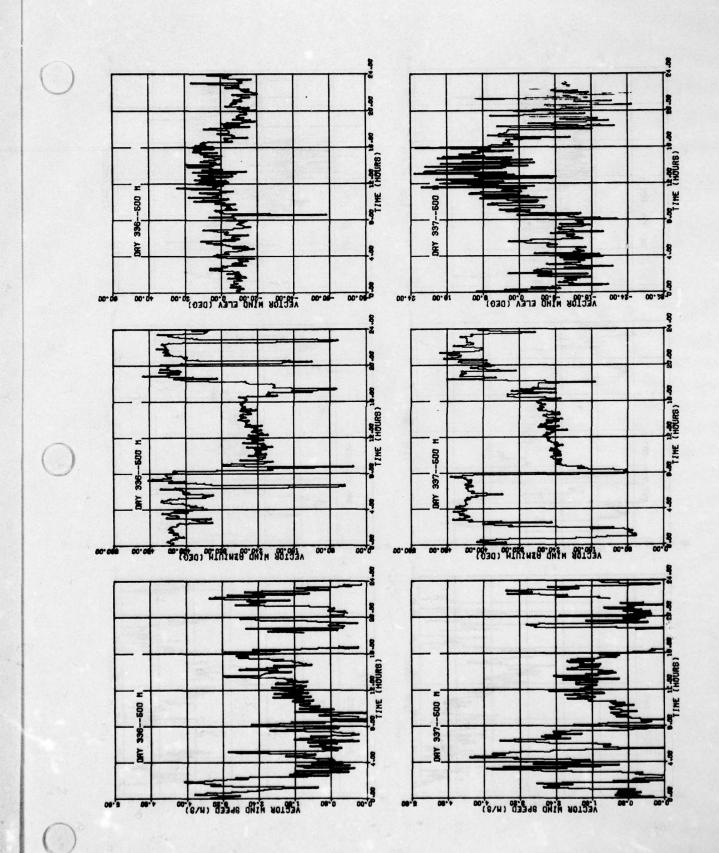


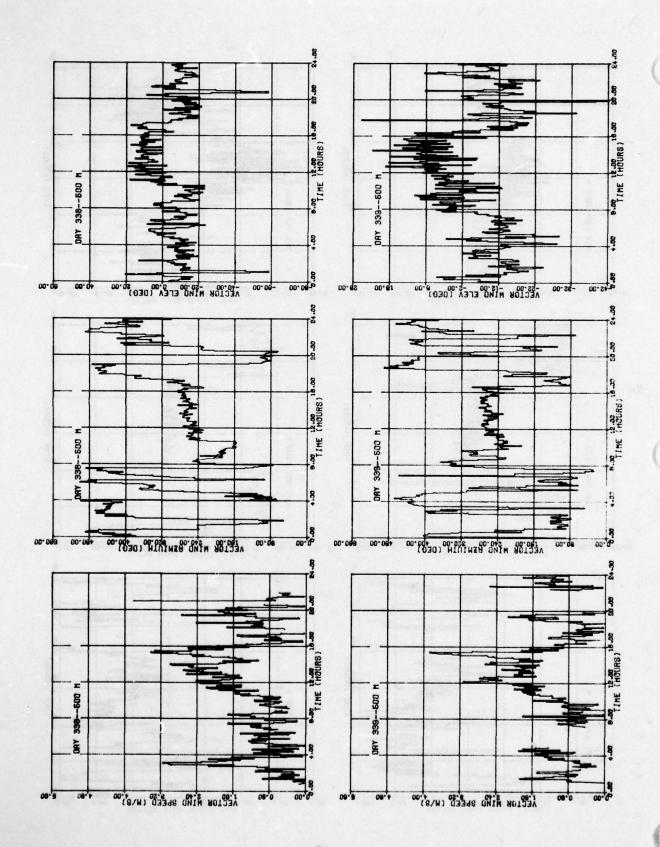


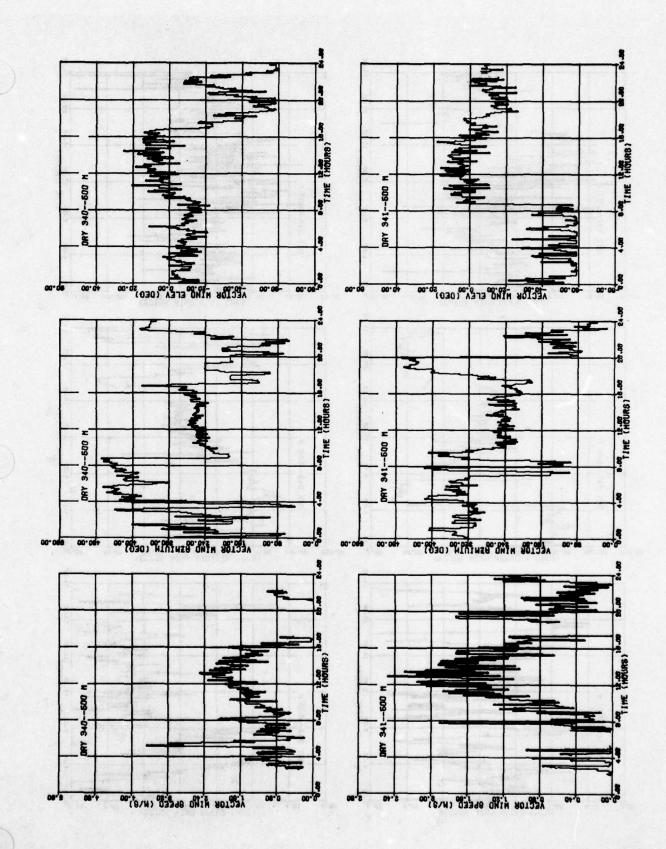


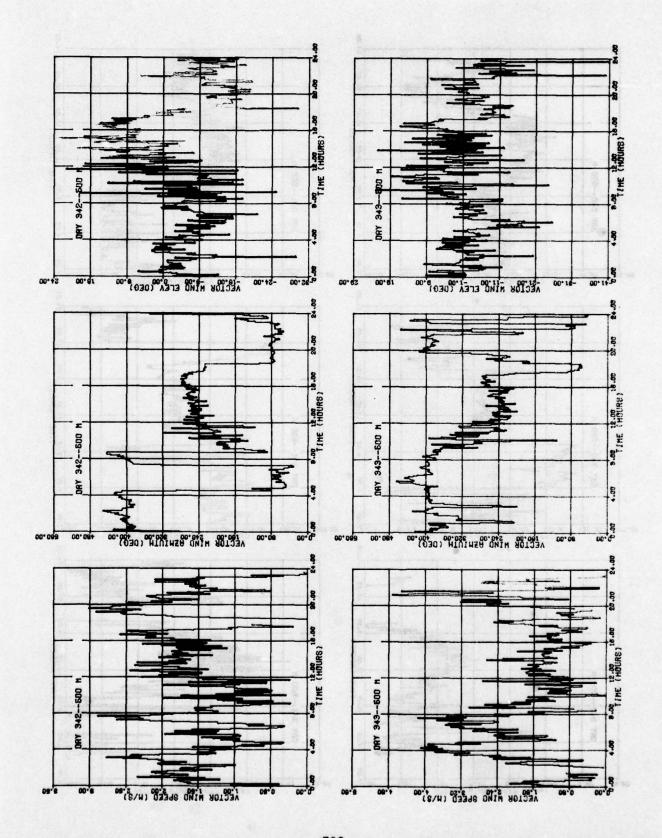


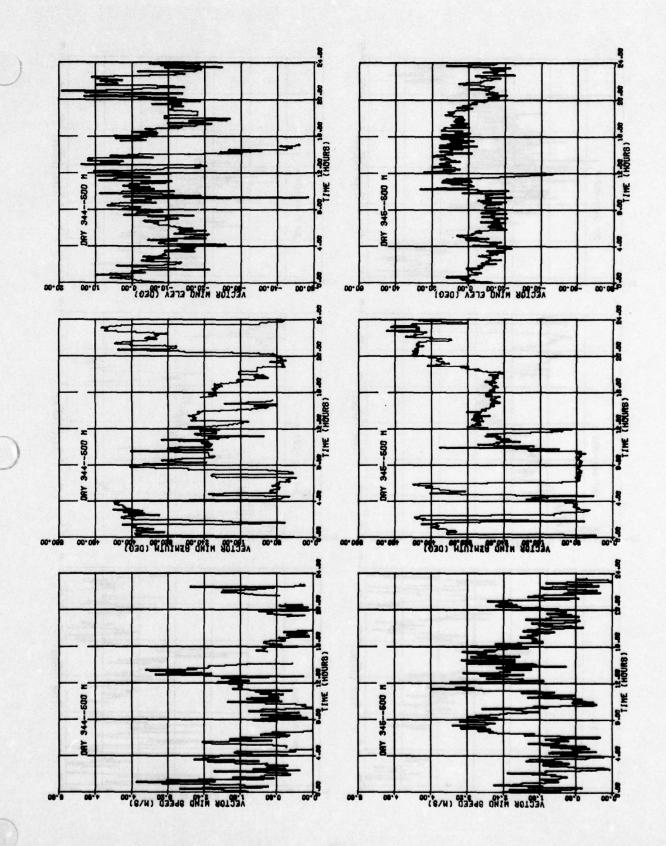


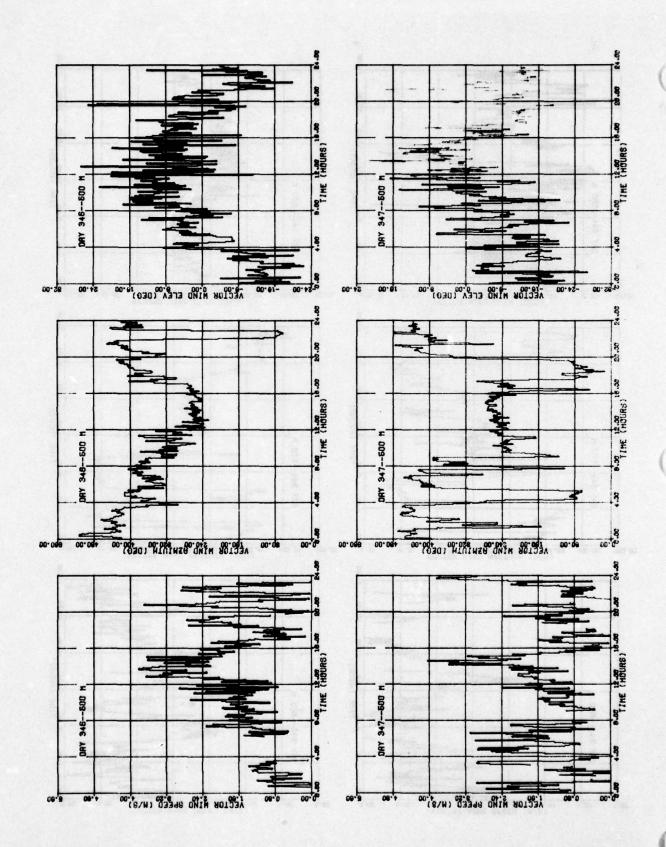


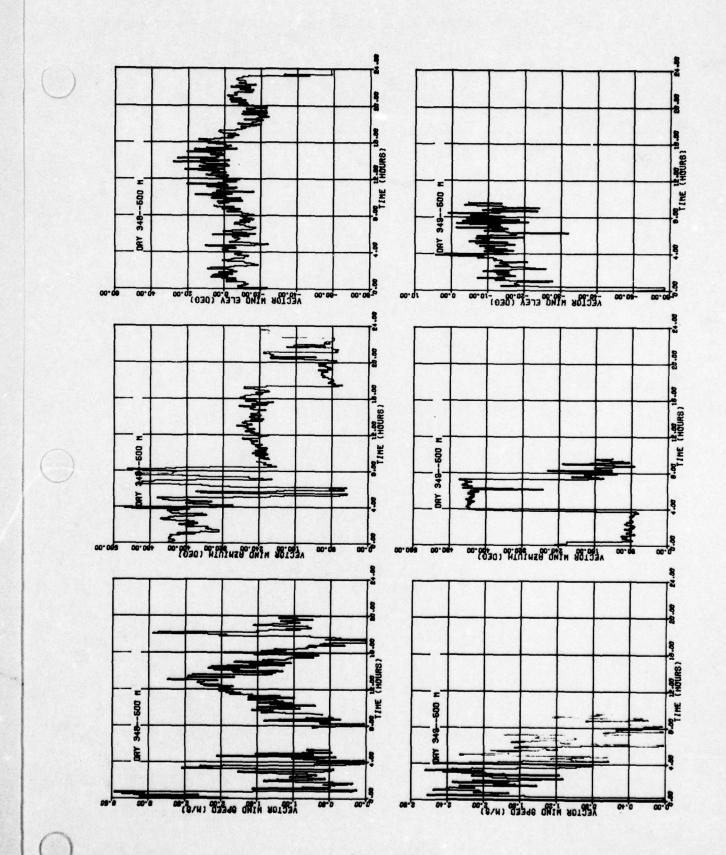












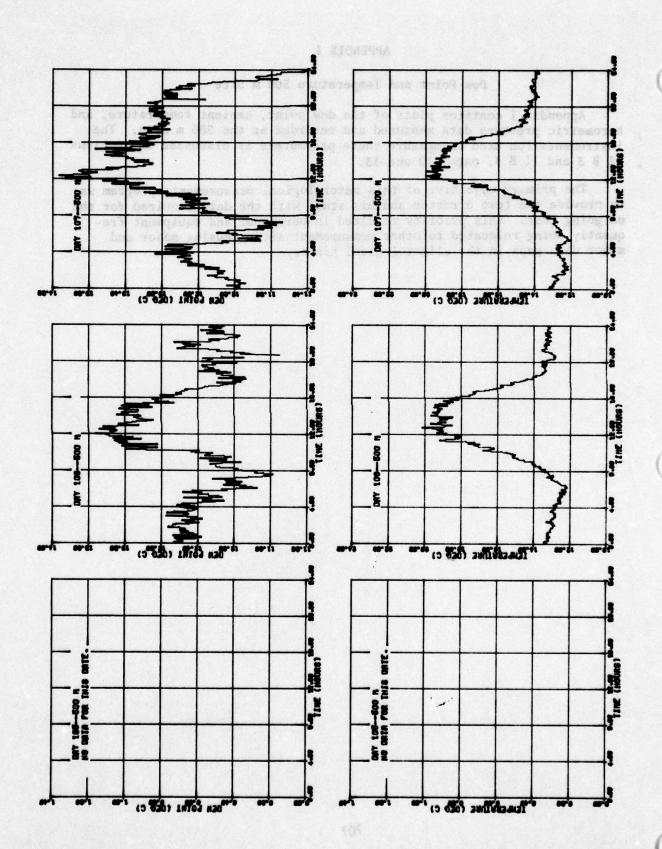
APPENDIX I

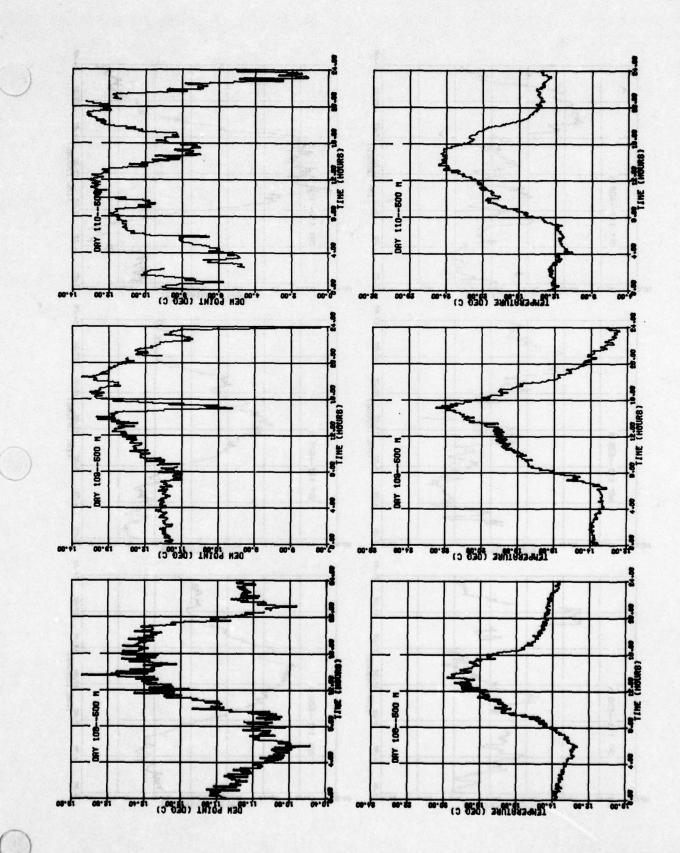
Dew Point and Temperature 500 m Site

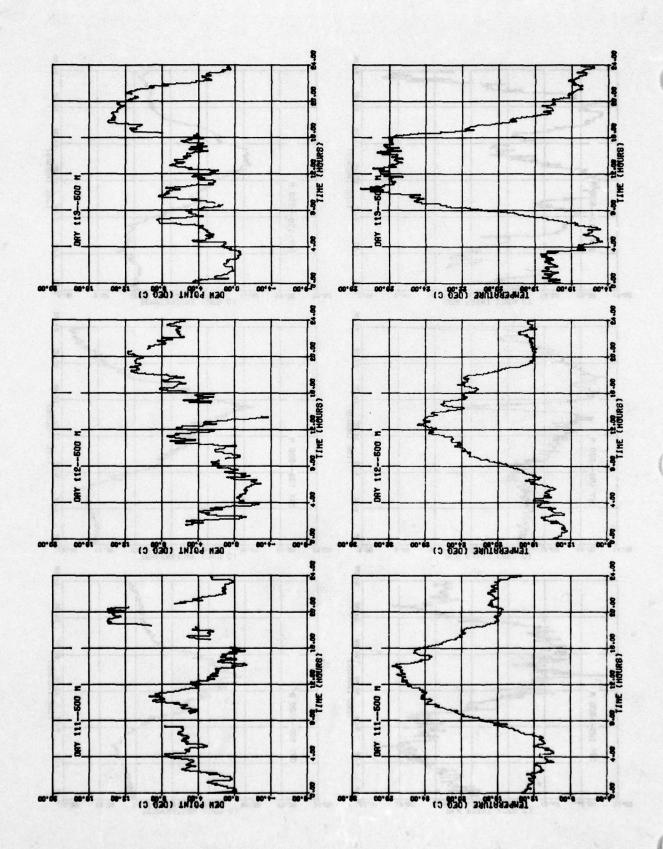
Appendix I contains plots of the dew point, ambient temperature, and barometric pressure data measured and recorded at the 500 m Site. The instrumentation used to measure these parameters is discussed in sections II B 3 and II B 4, pages 12 and 13.

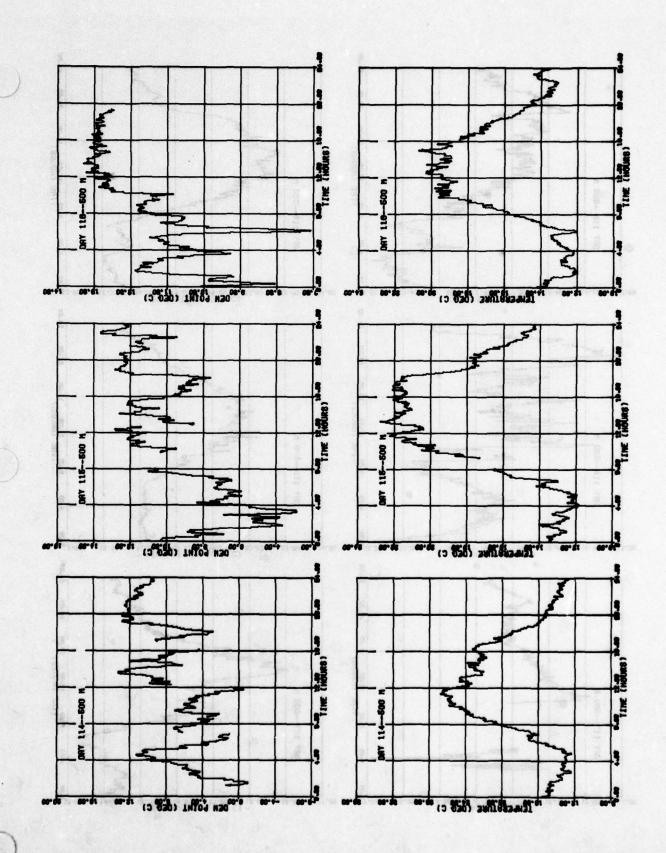
The primary objective of this meterological measurements program was to provide the test director and his staff with the data required for the on going test. This priority resulted in personnel and equipment frequently being relocated to other measurement sites causing major and minor data gaps in the climatological history.

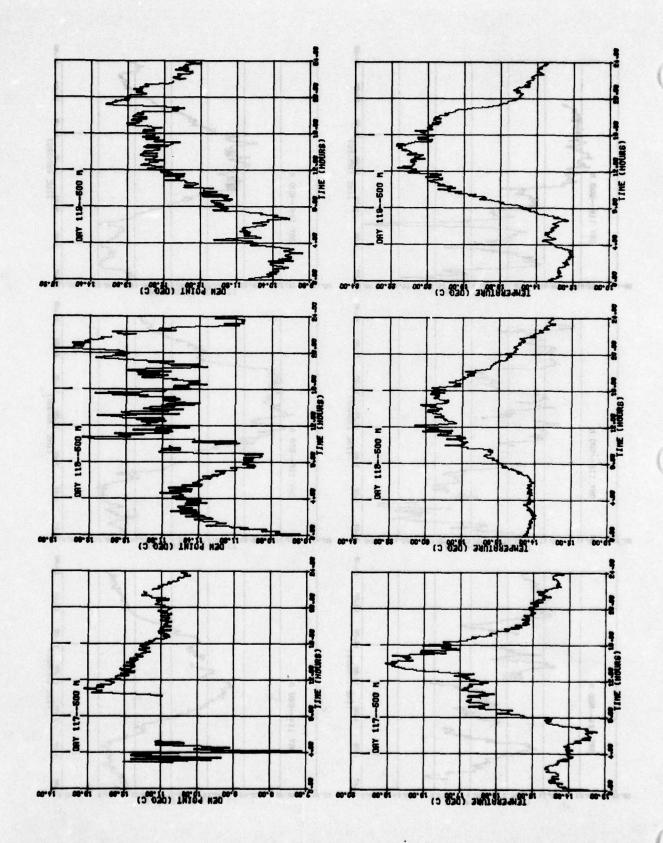
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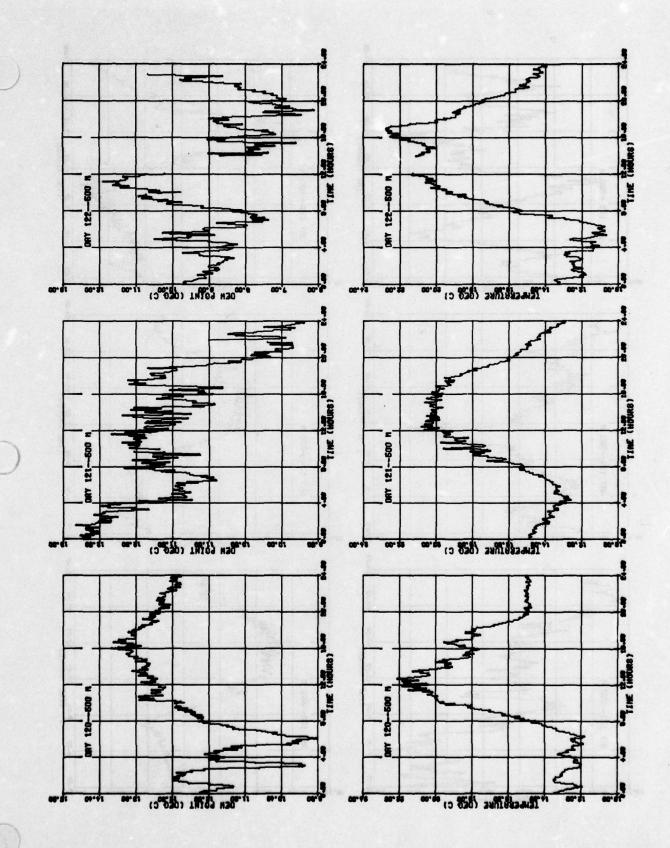


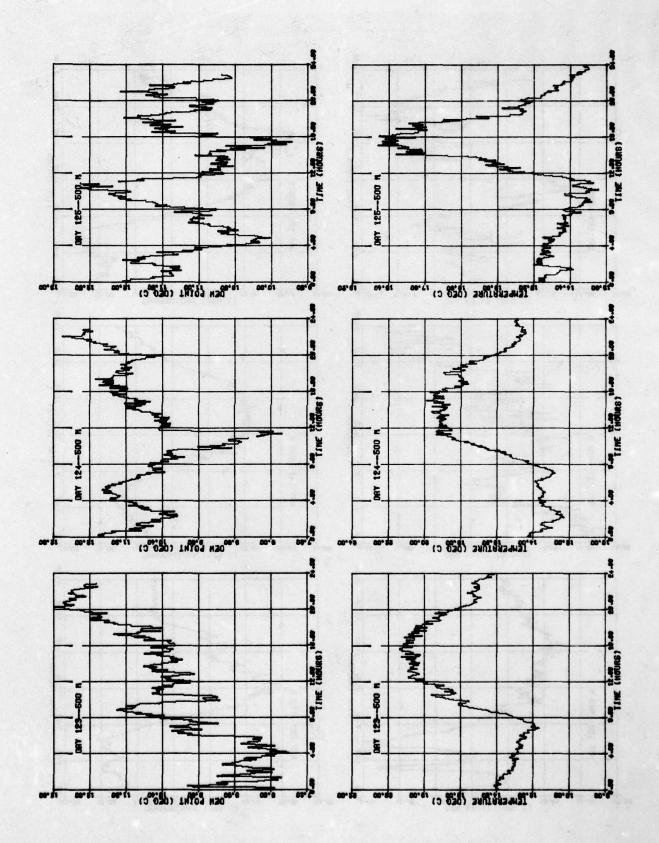


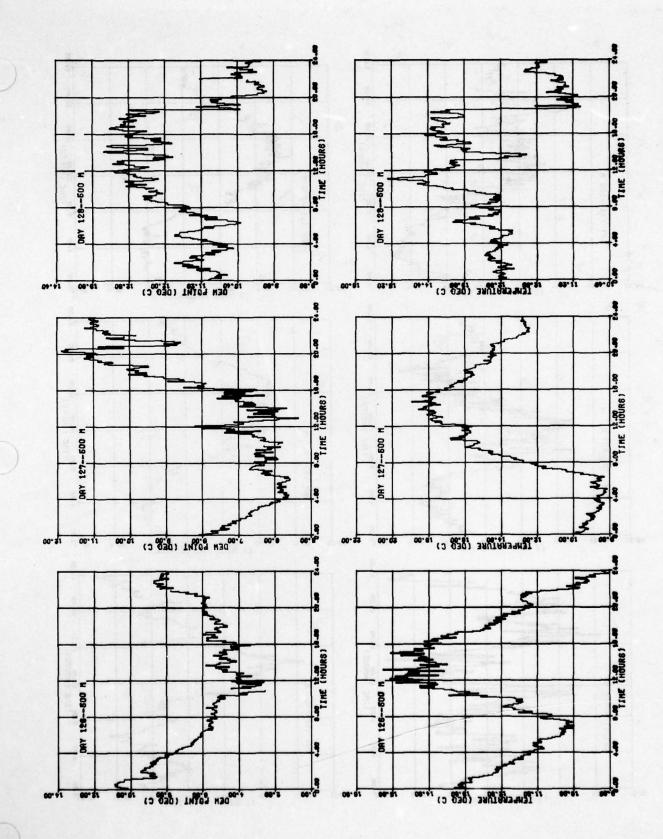


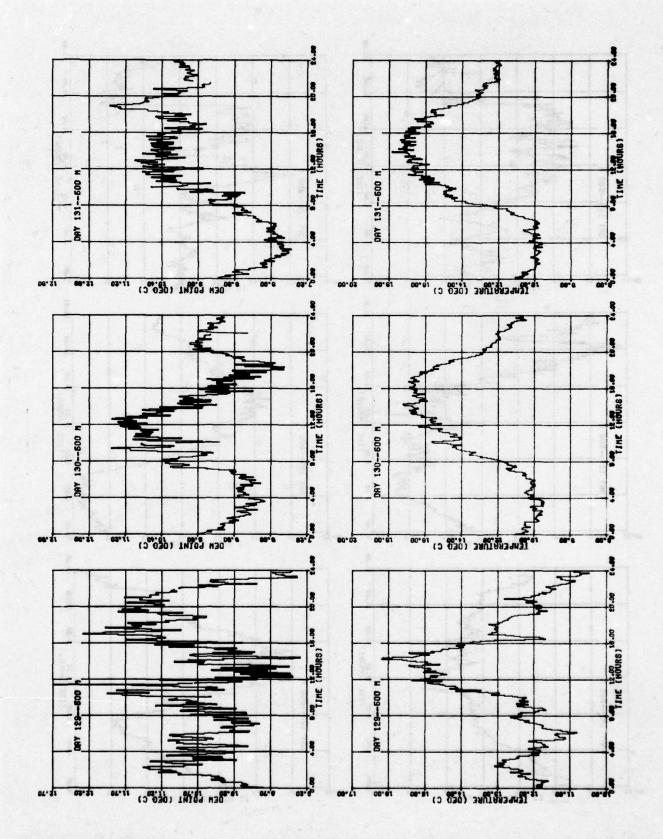


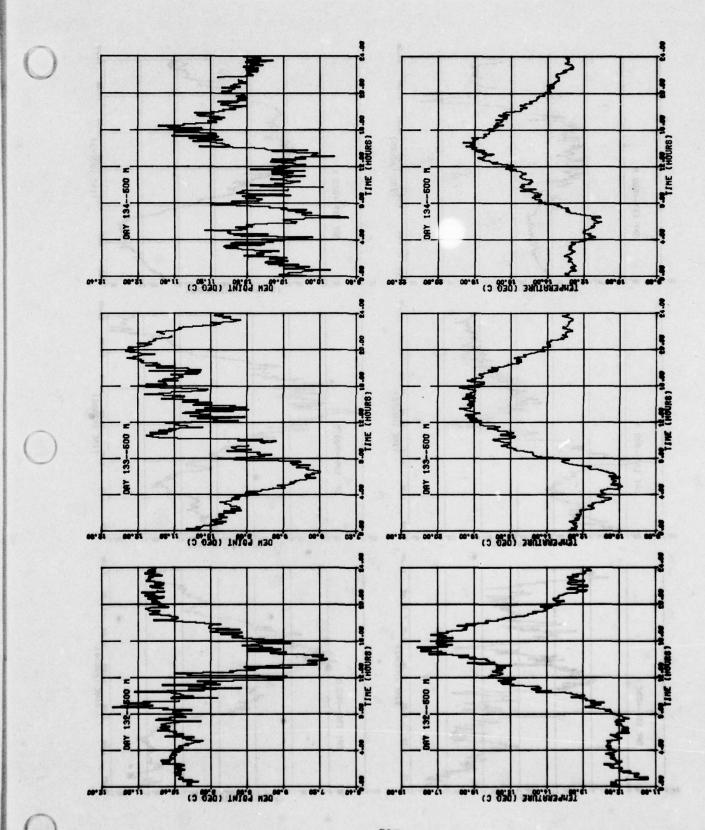


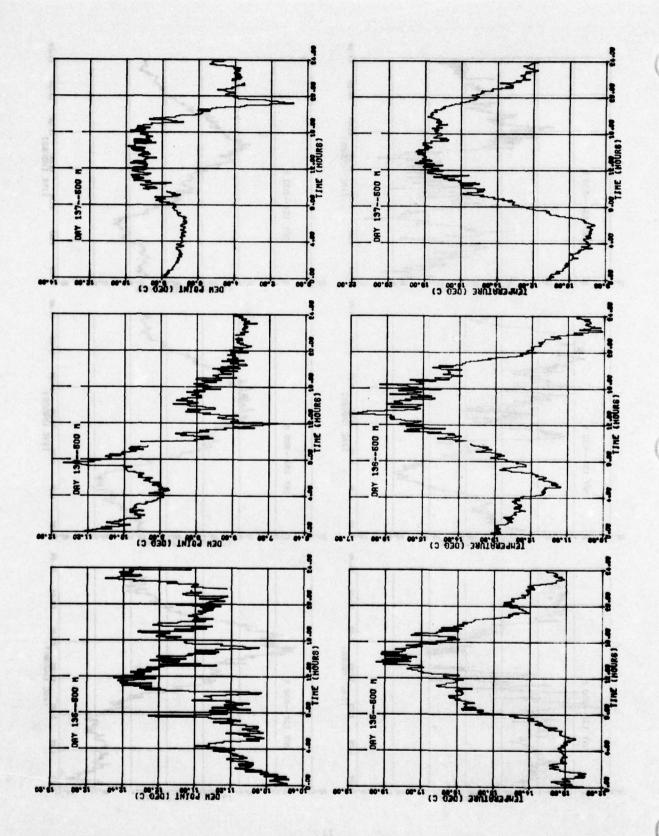


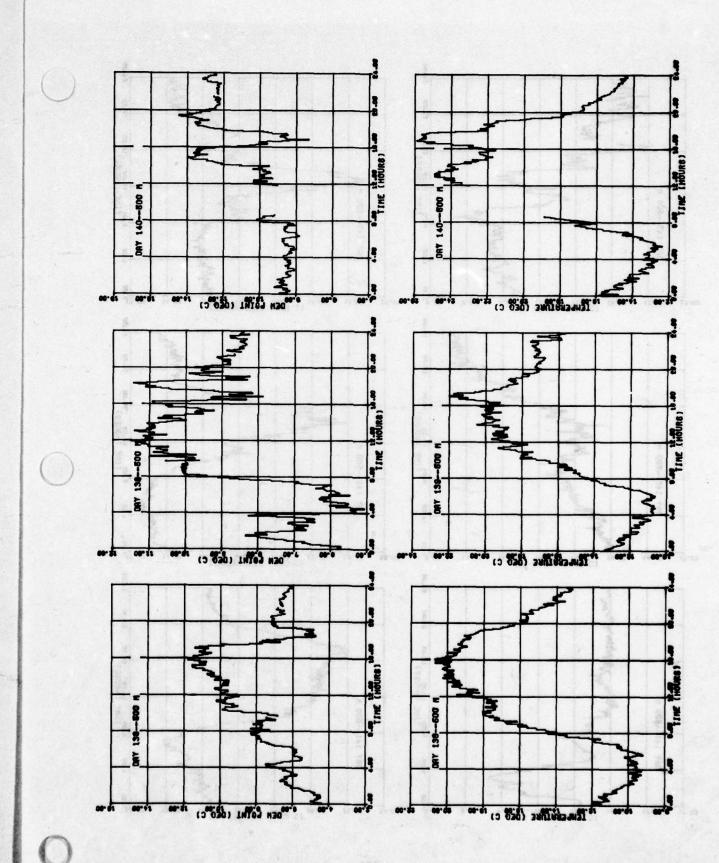


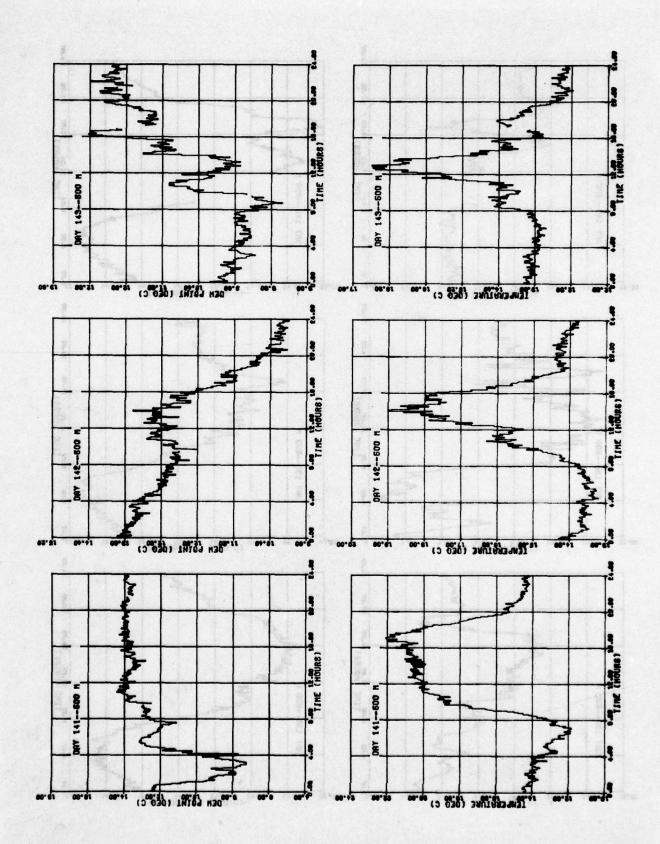


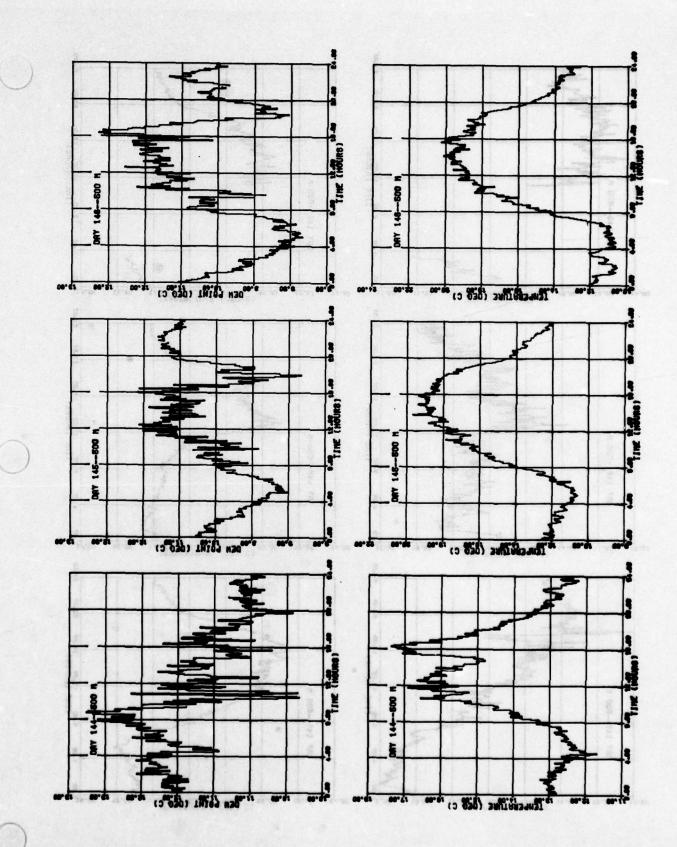


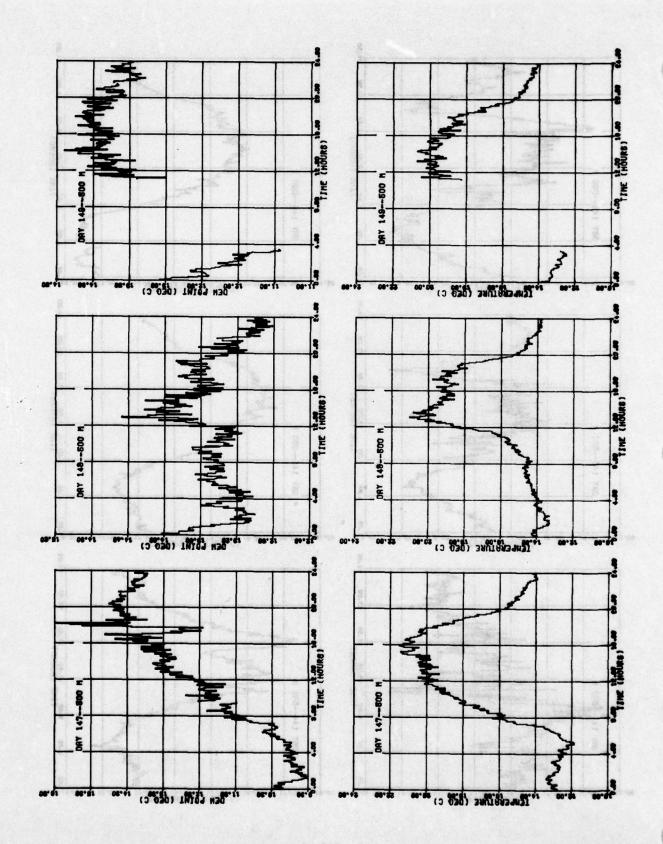


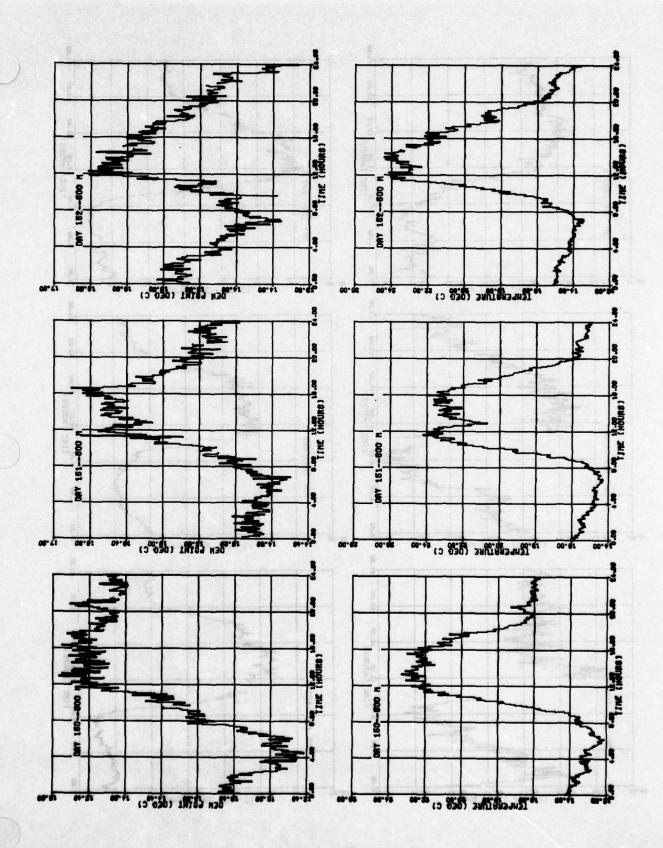


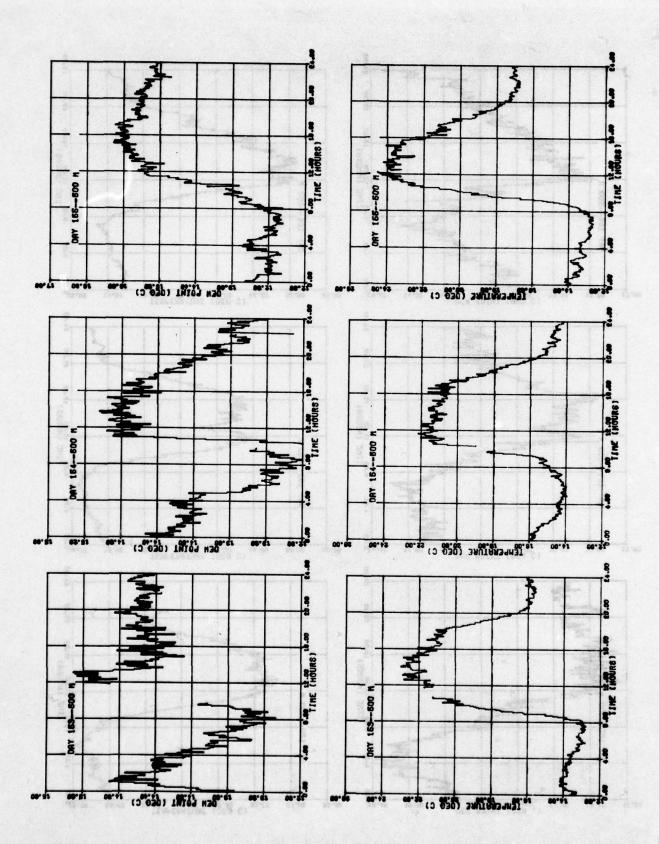


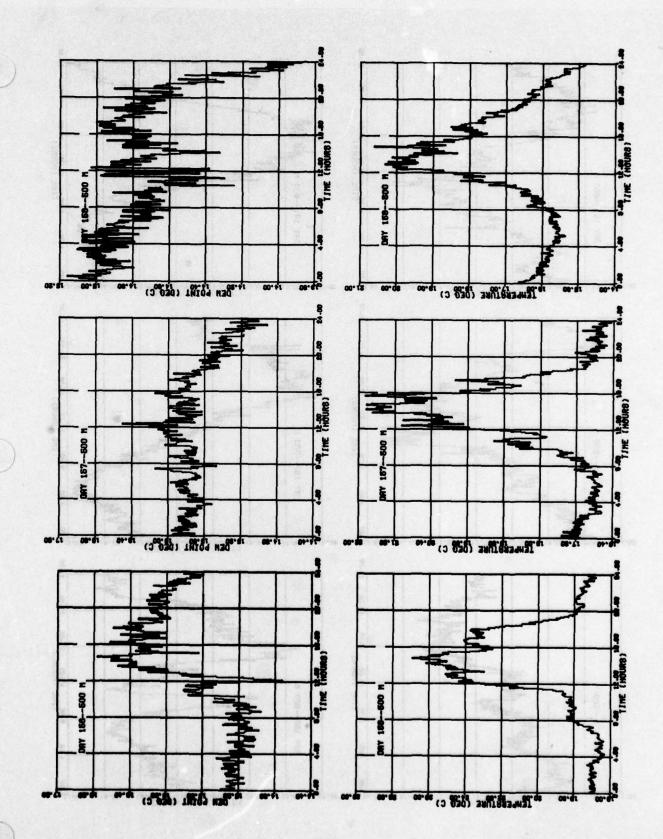


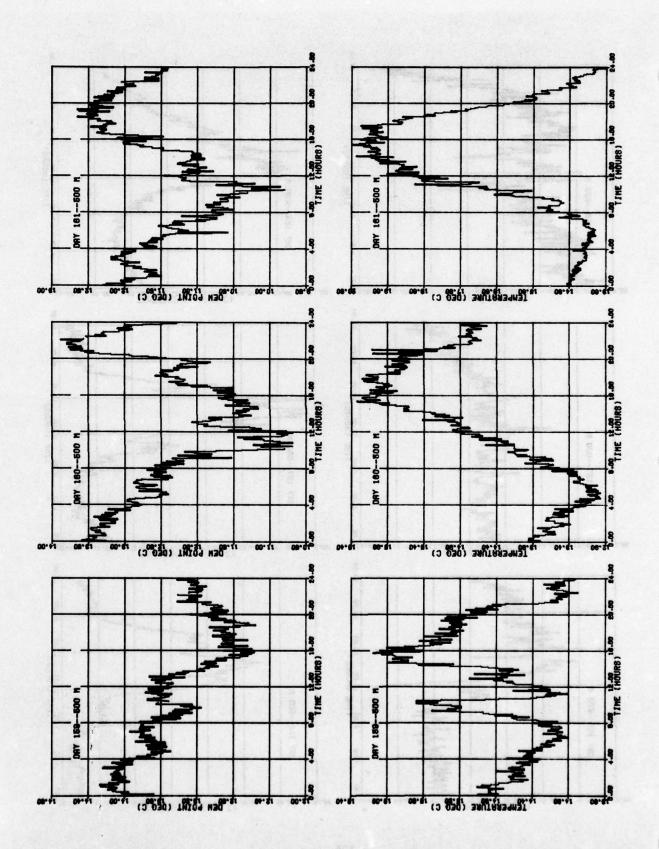


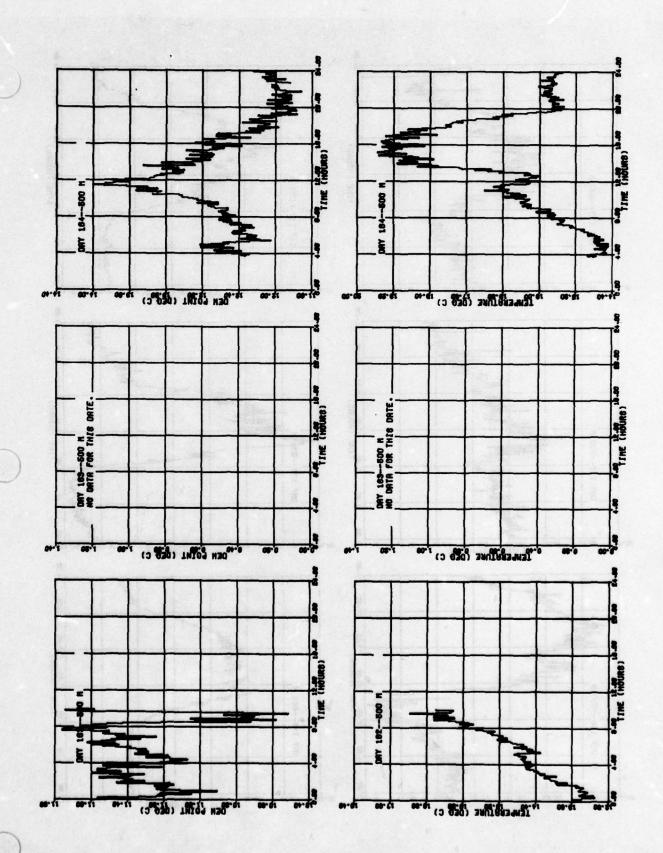


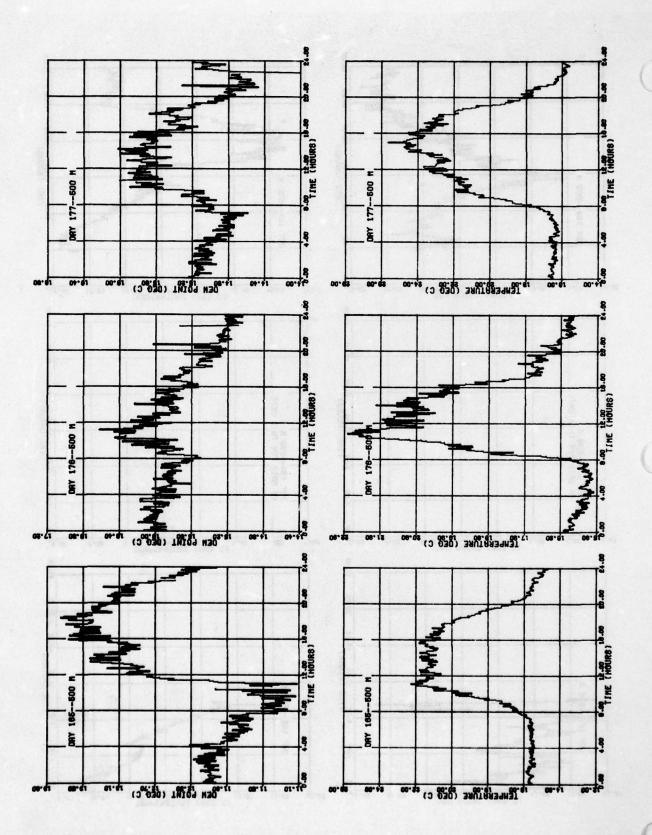


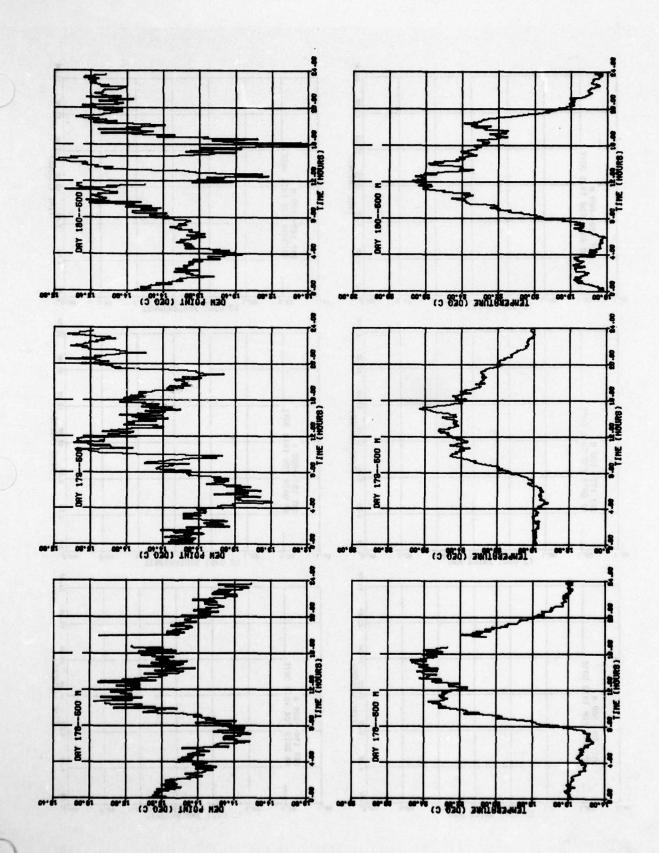


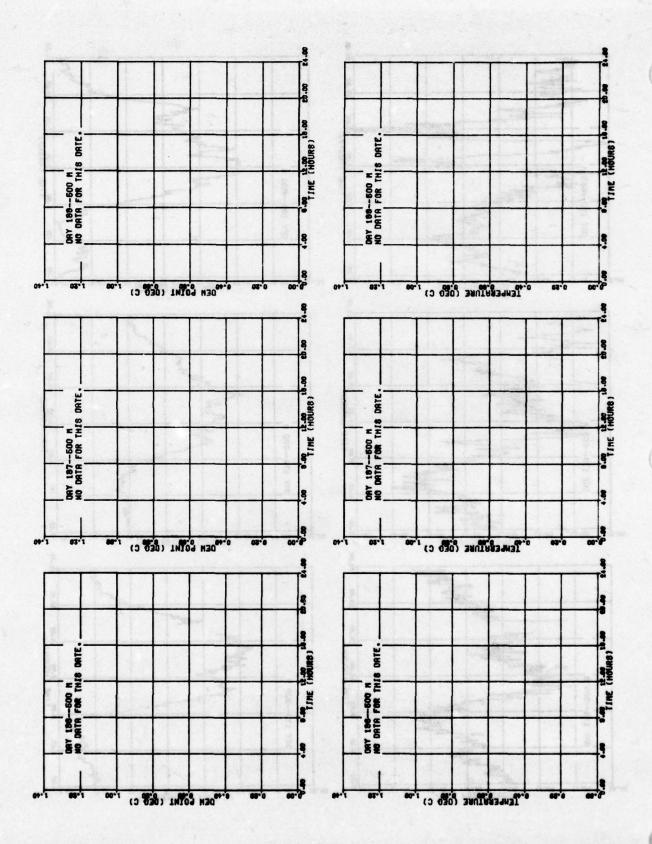


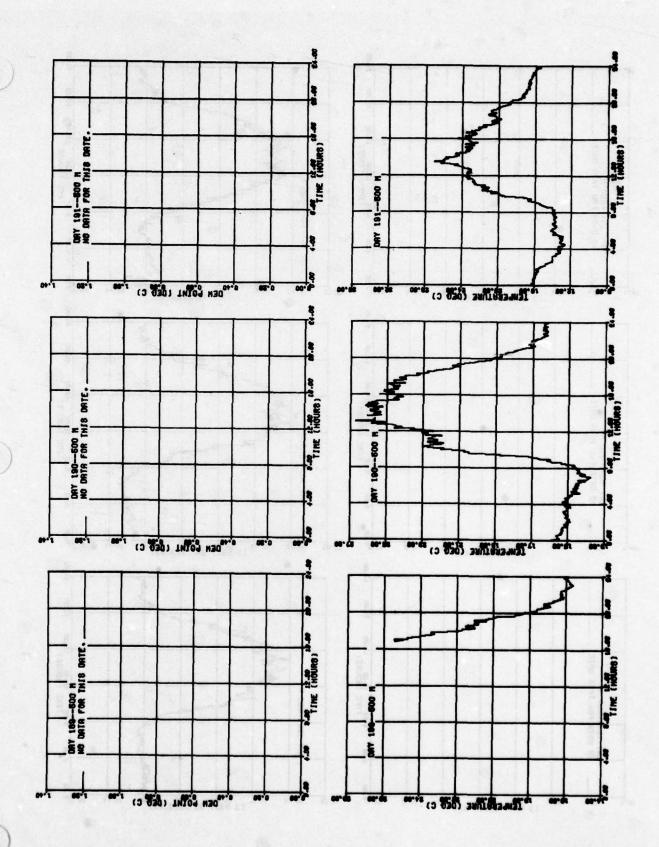


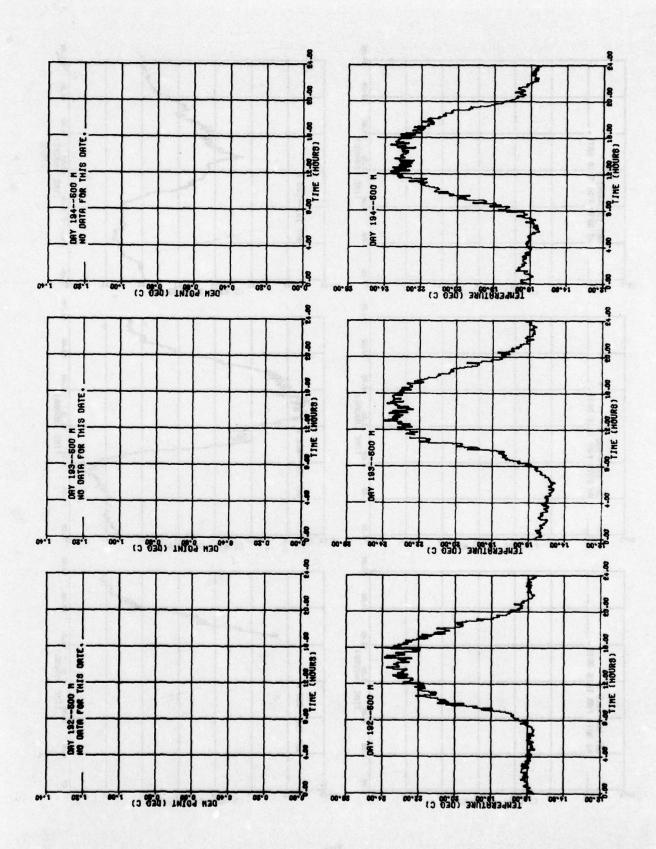


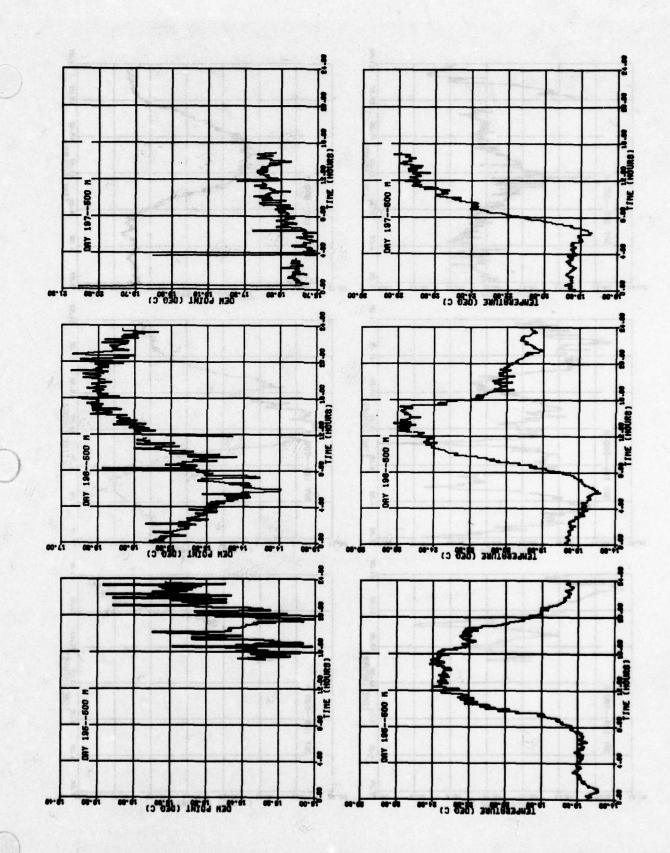


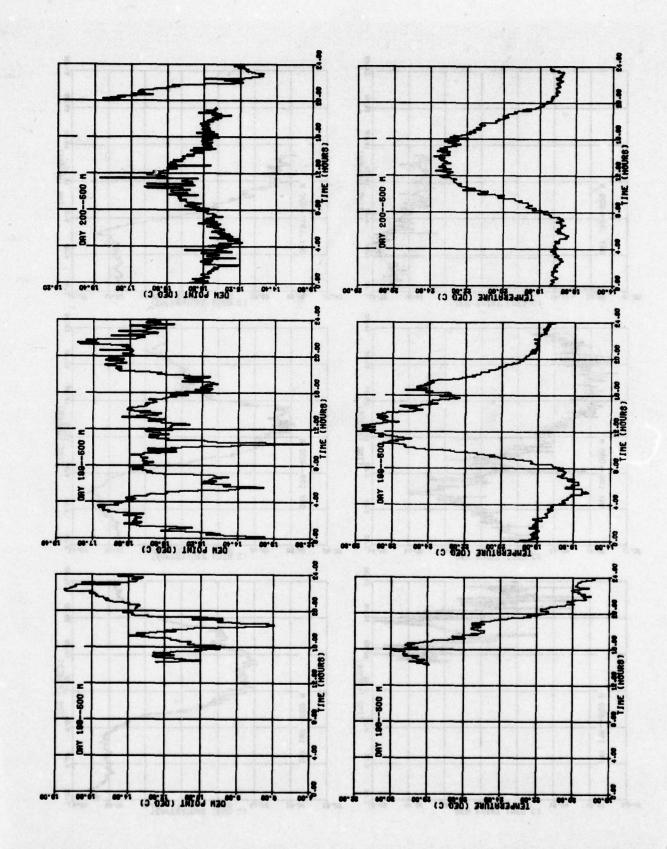


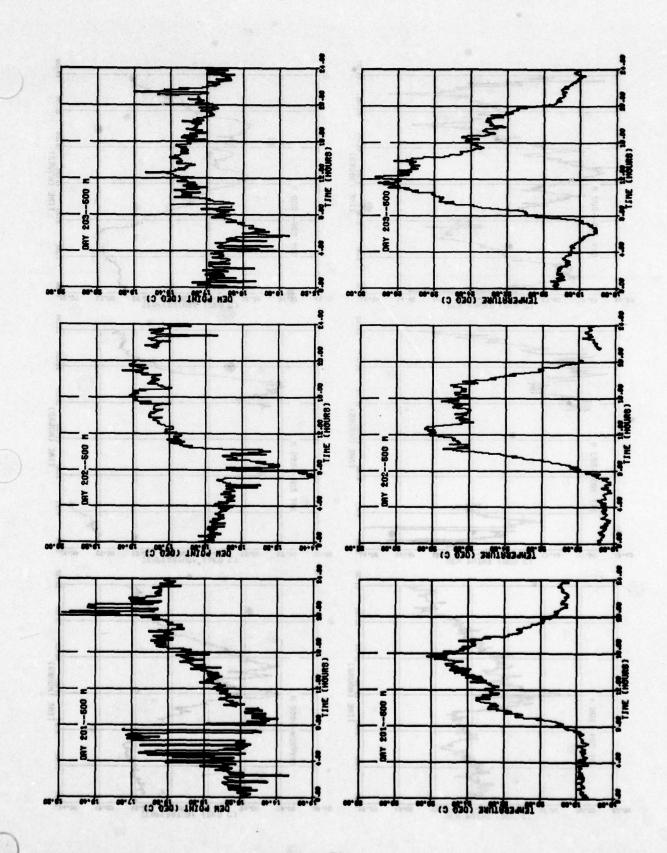


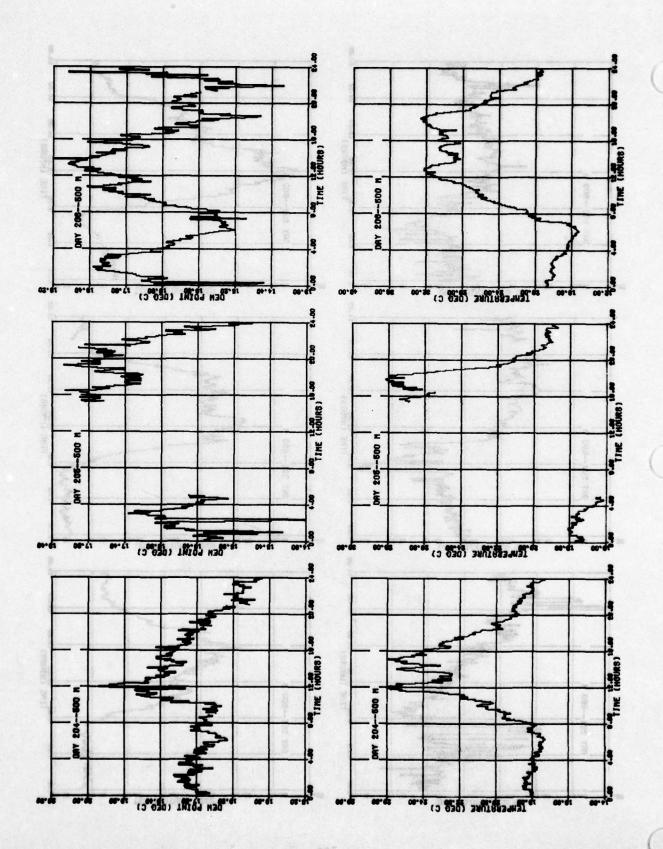


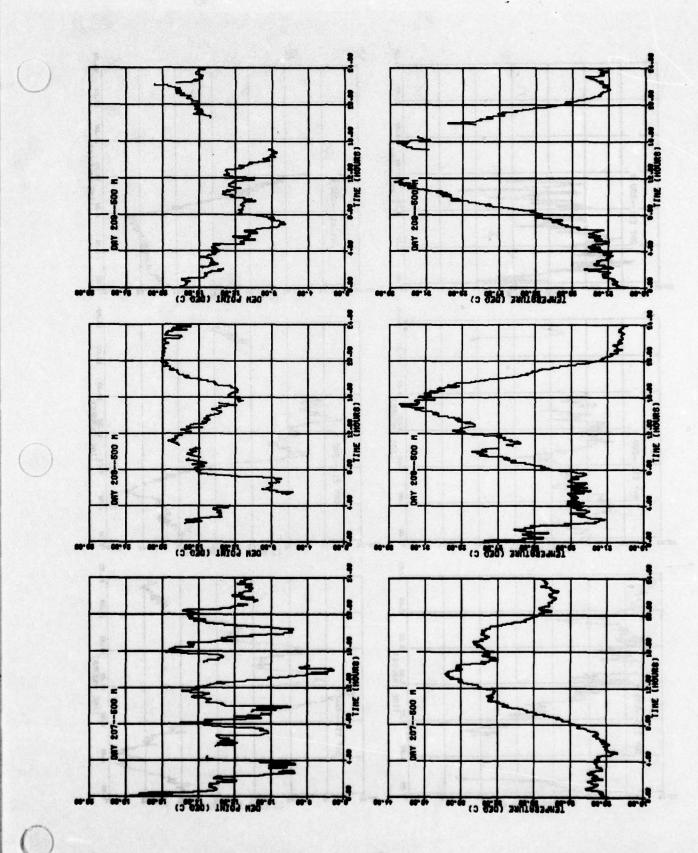


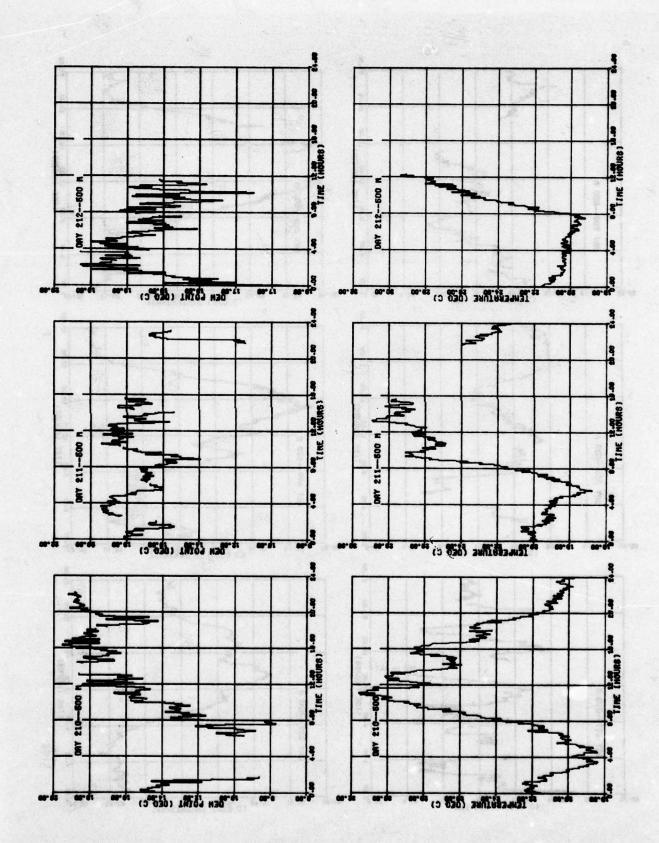


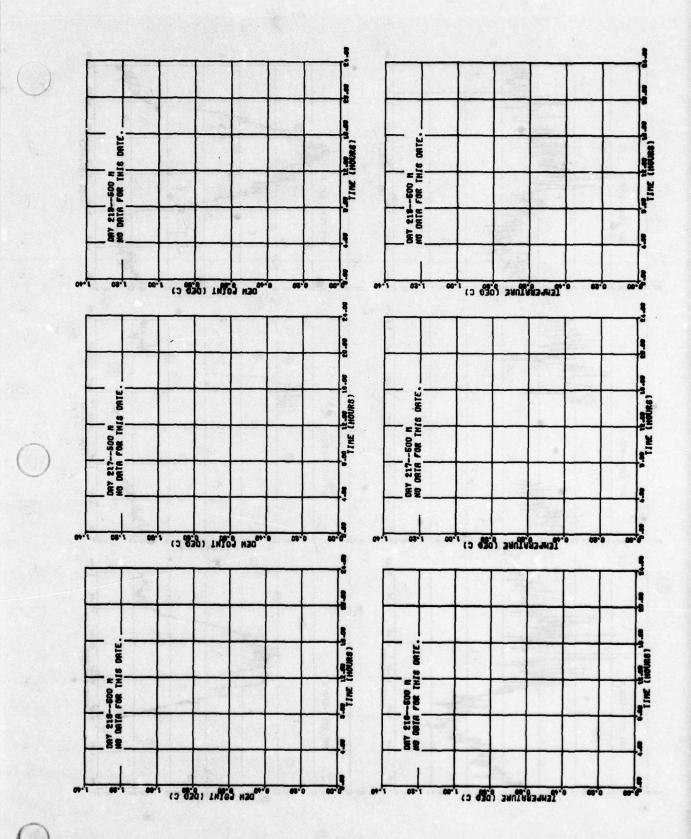


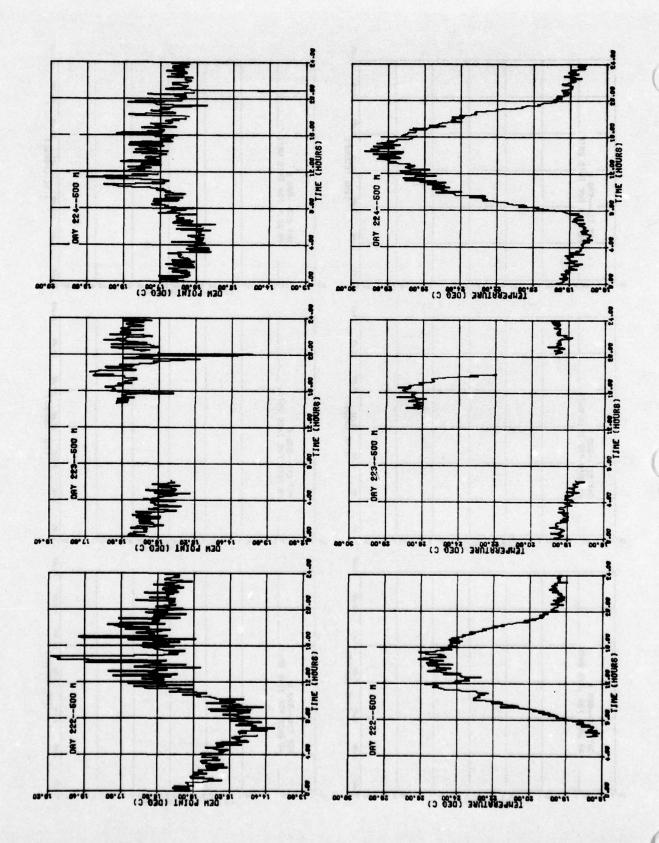


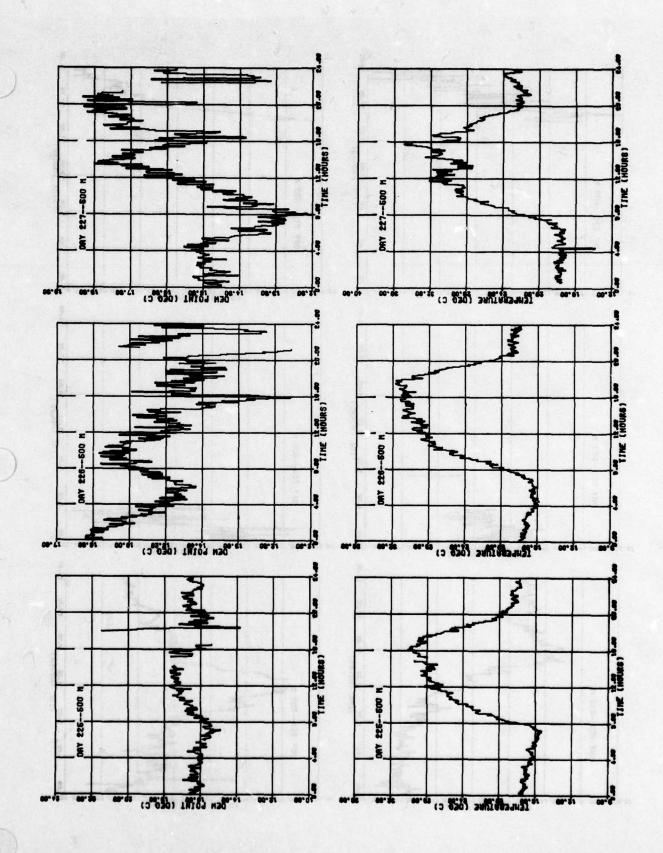


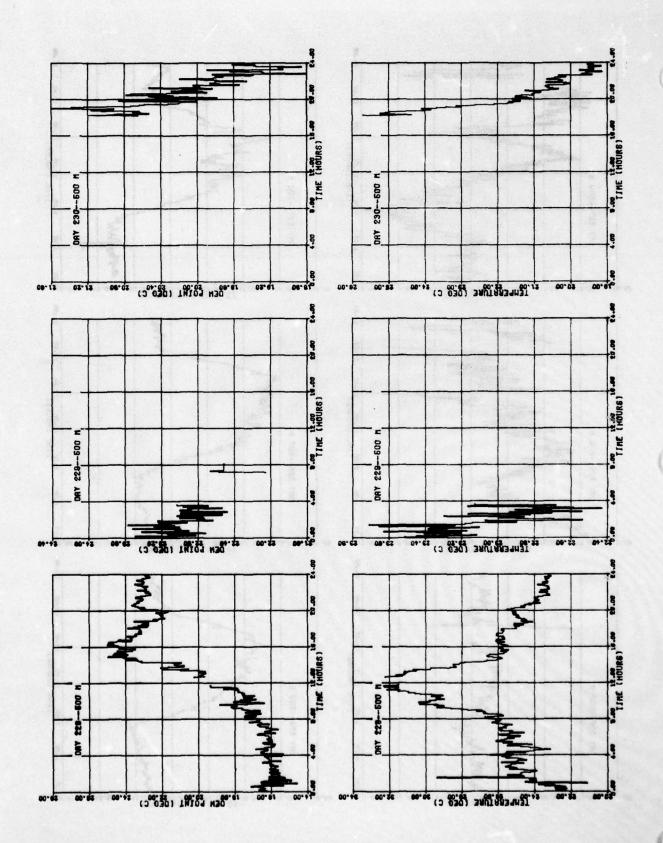


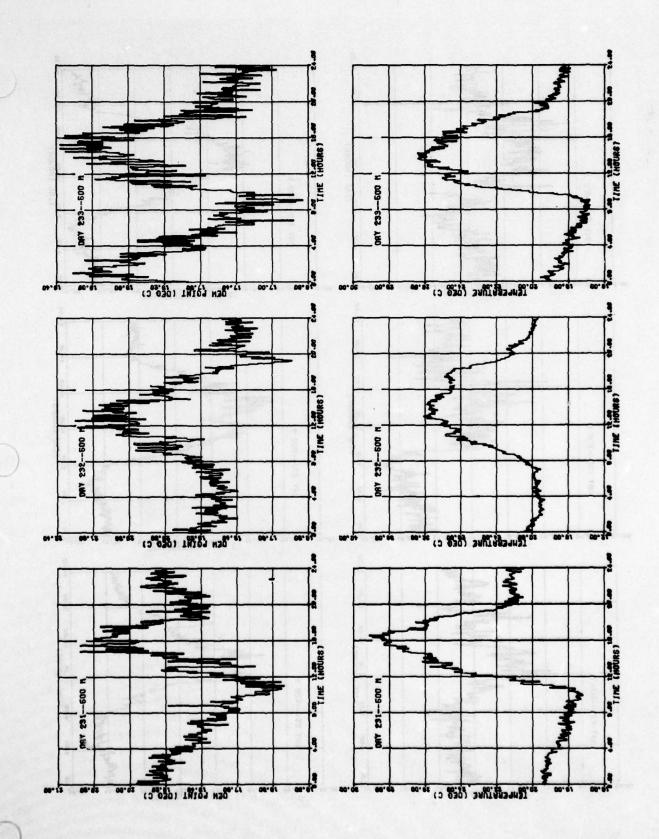


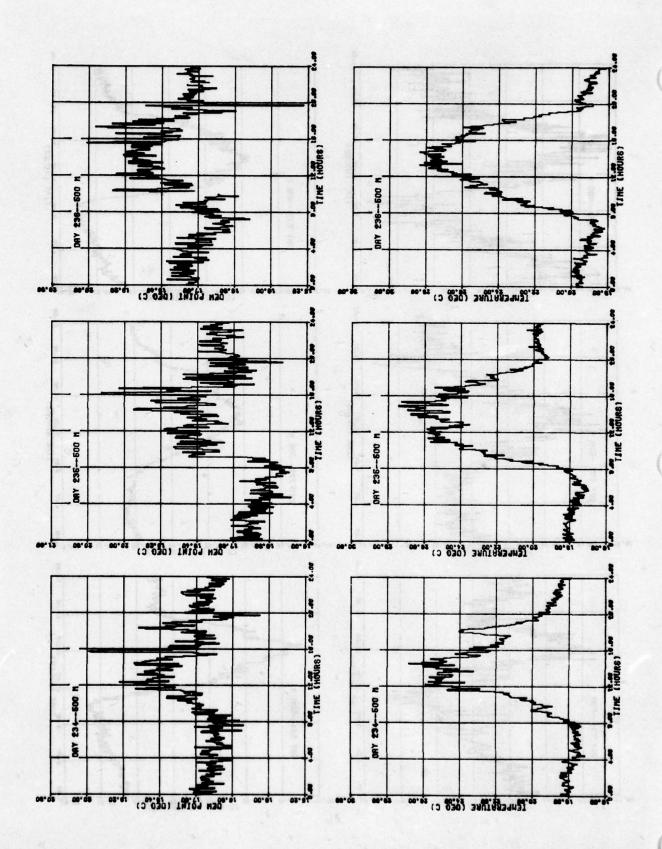


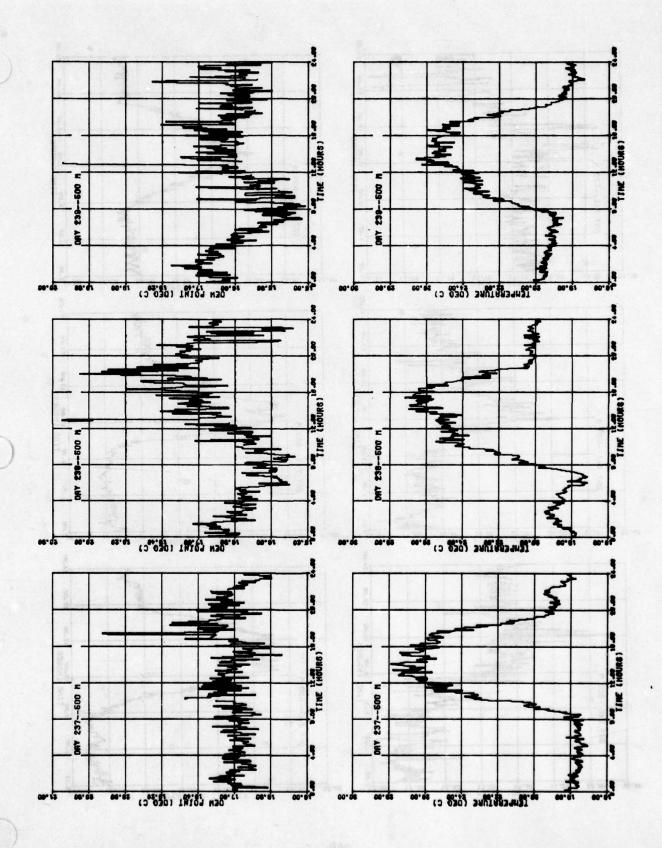


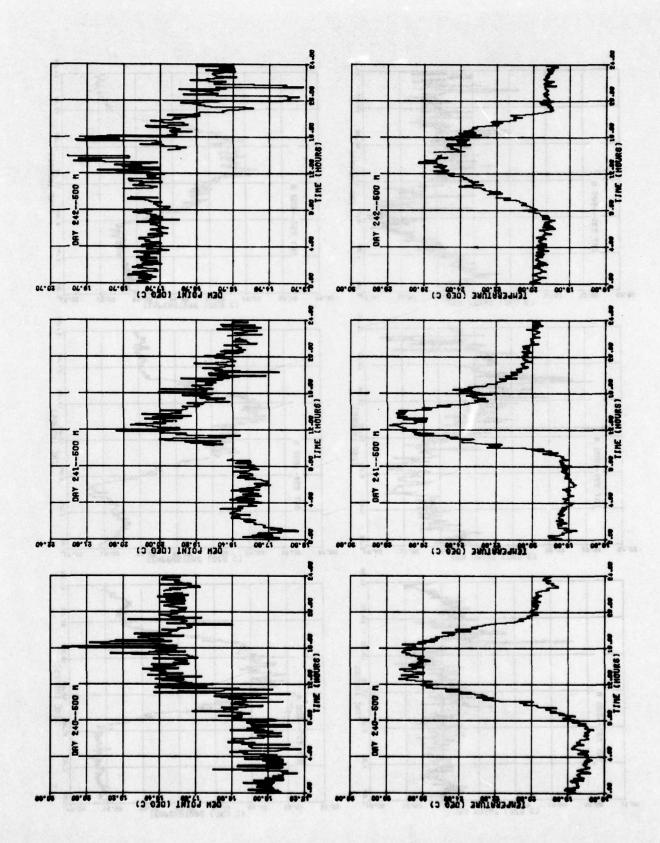


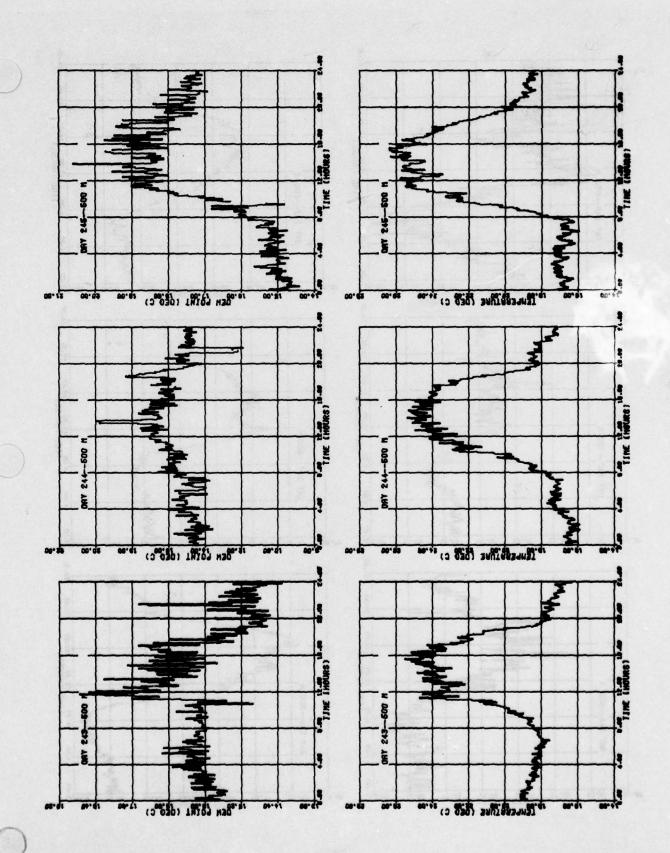


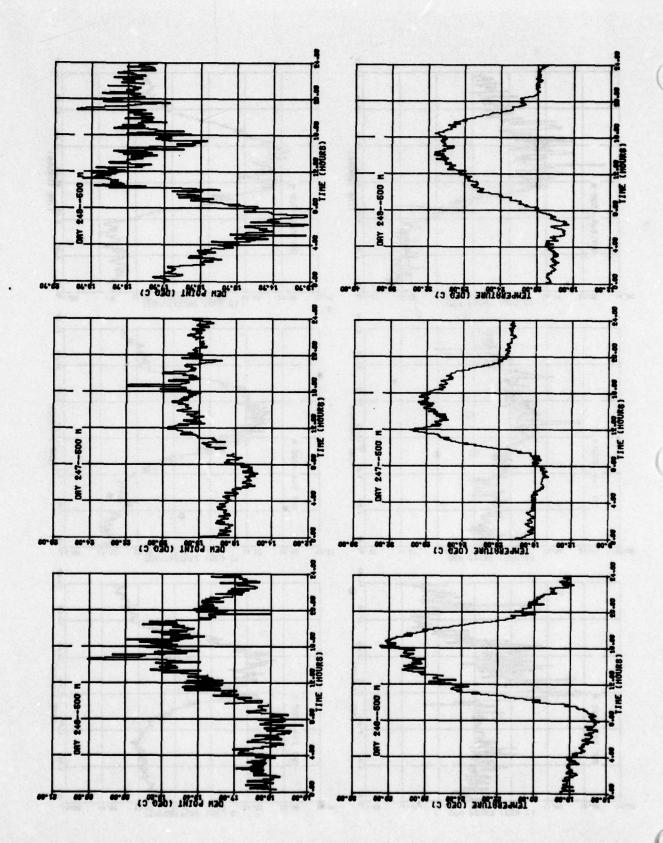


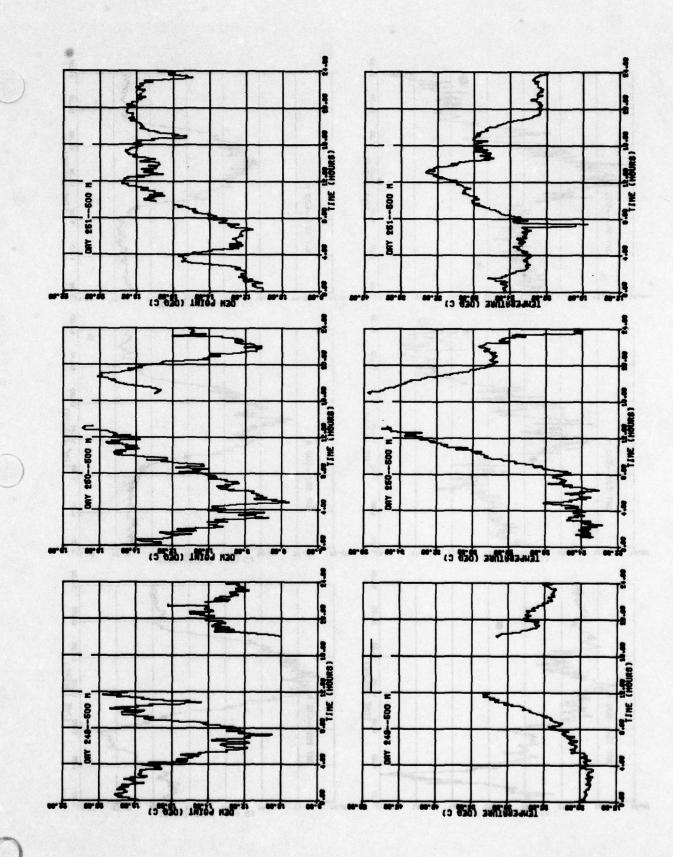


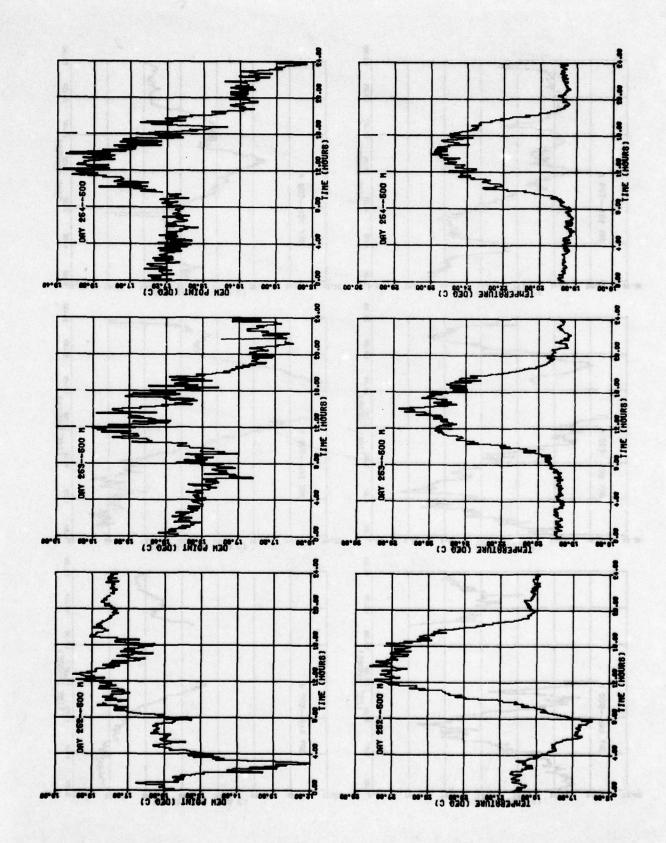


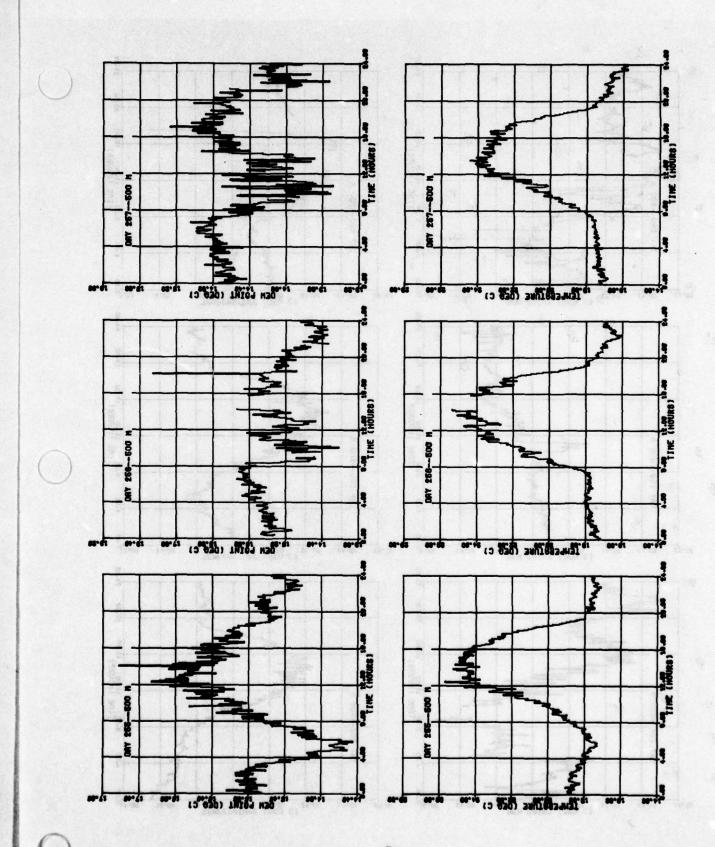


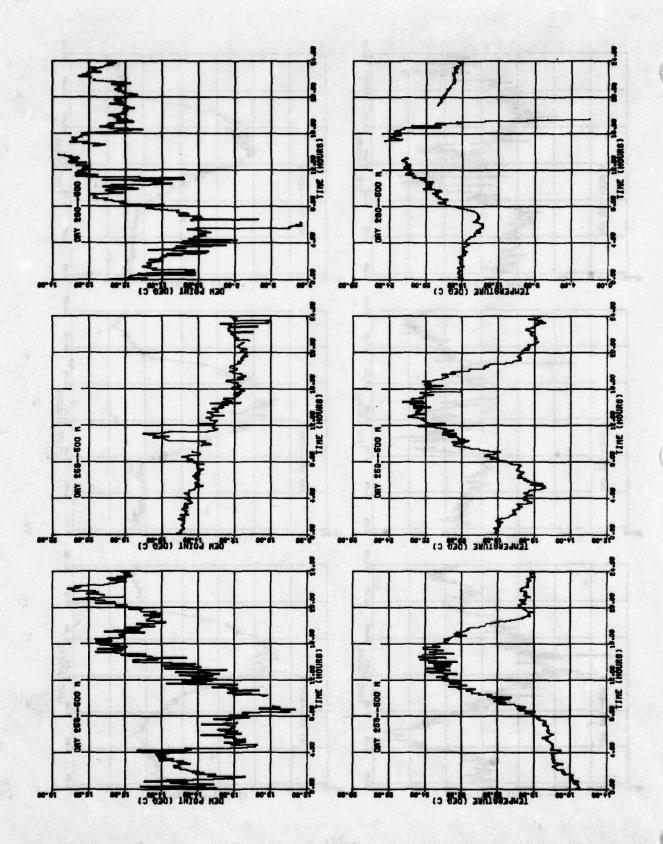


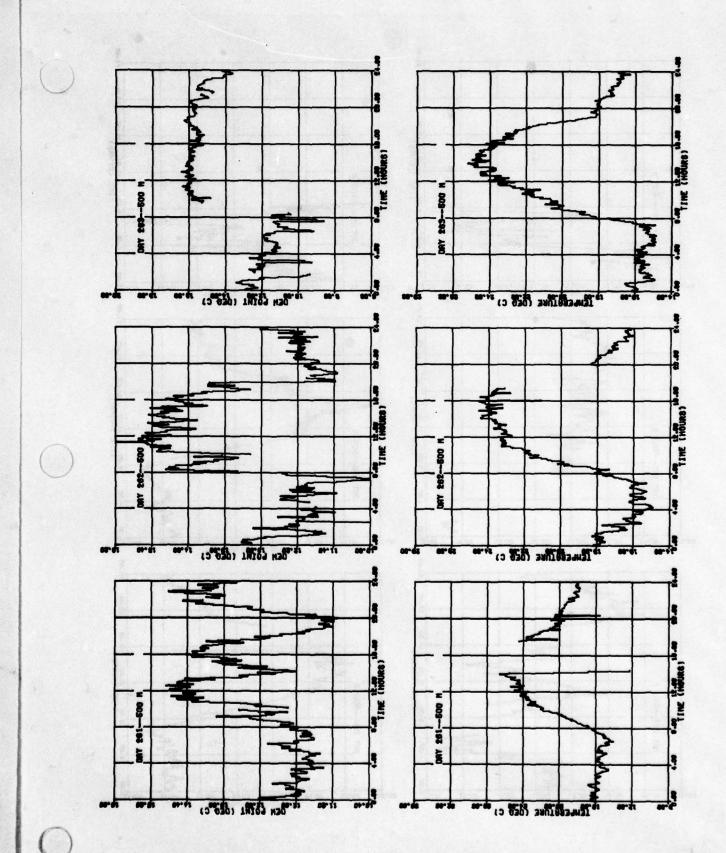


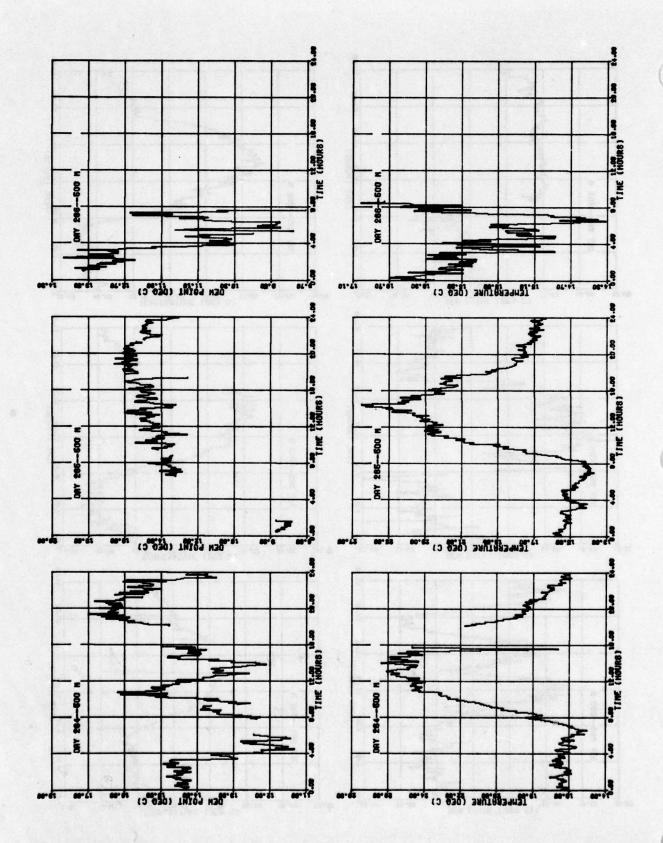


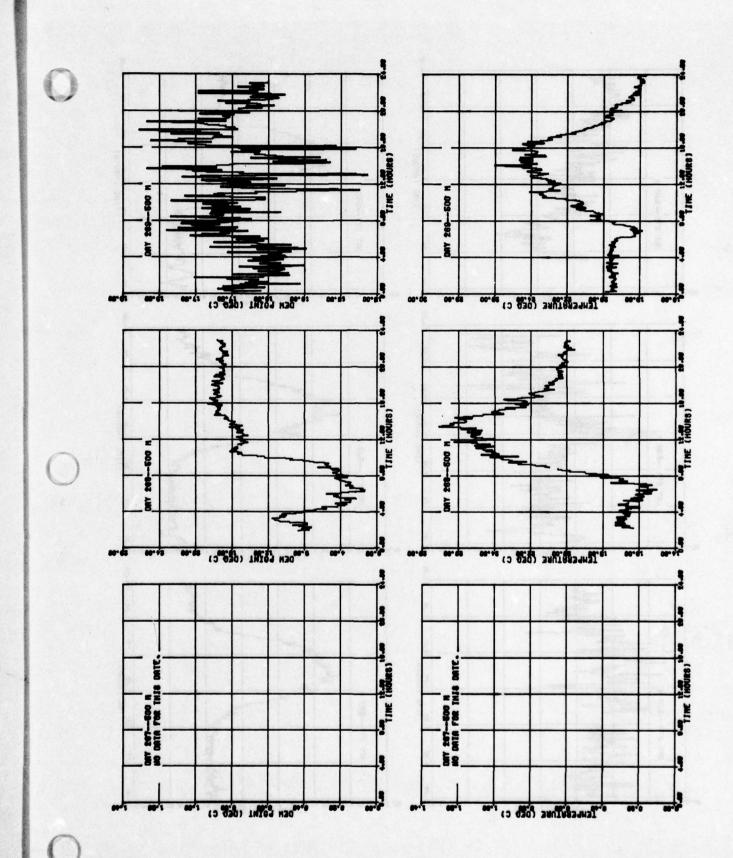


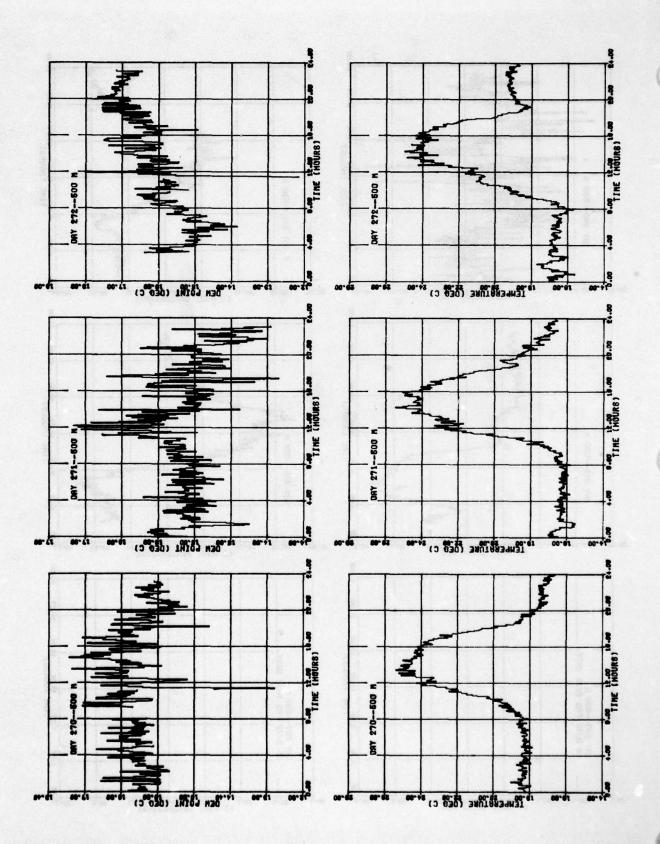


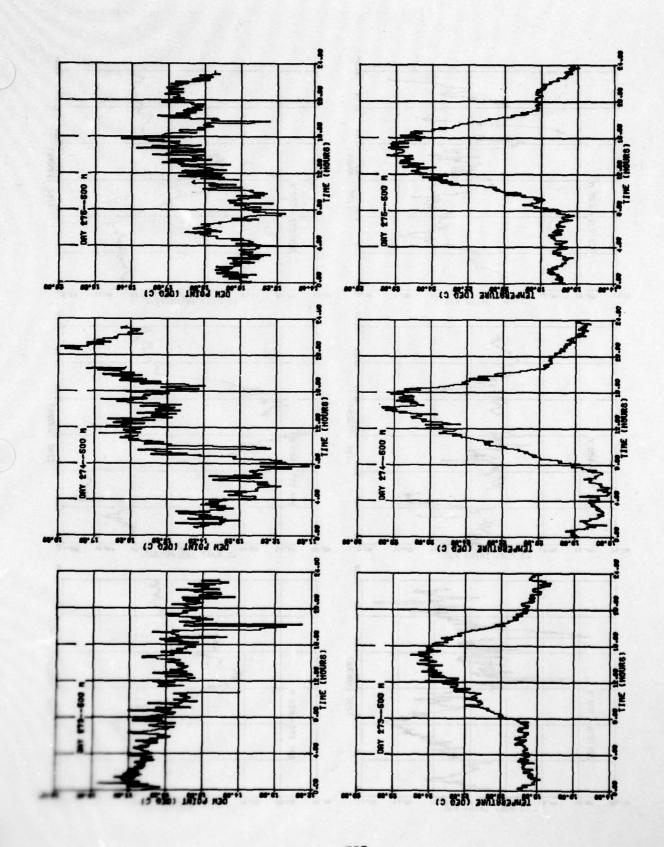


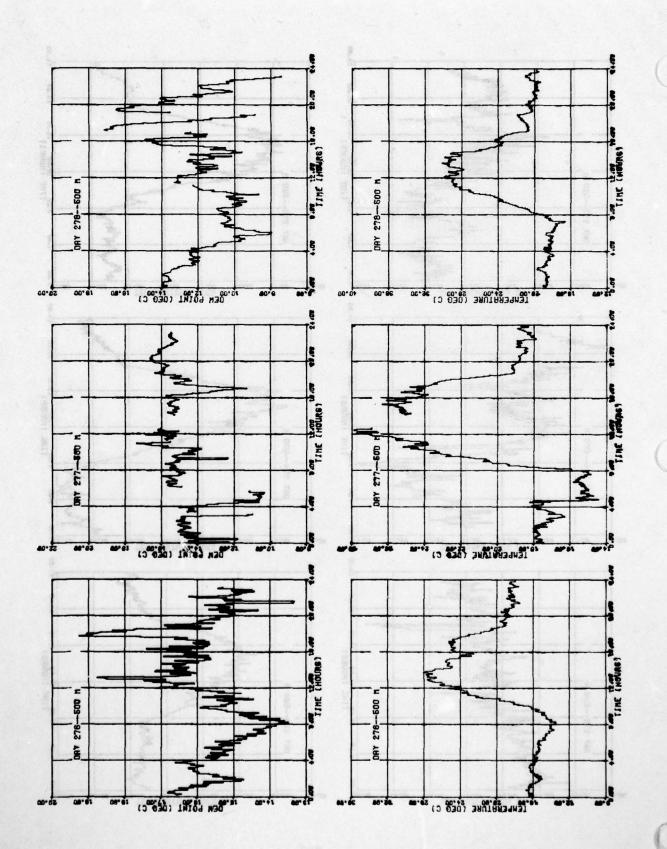


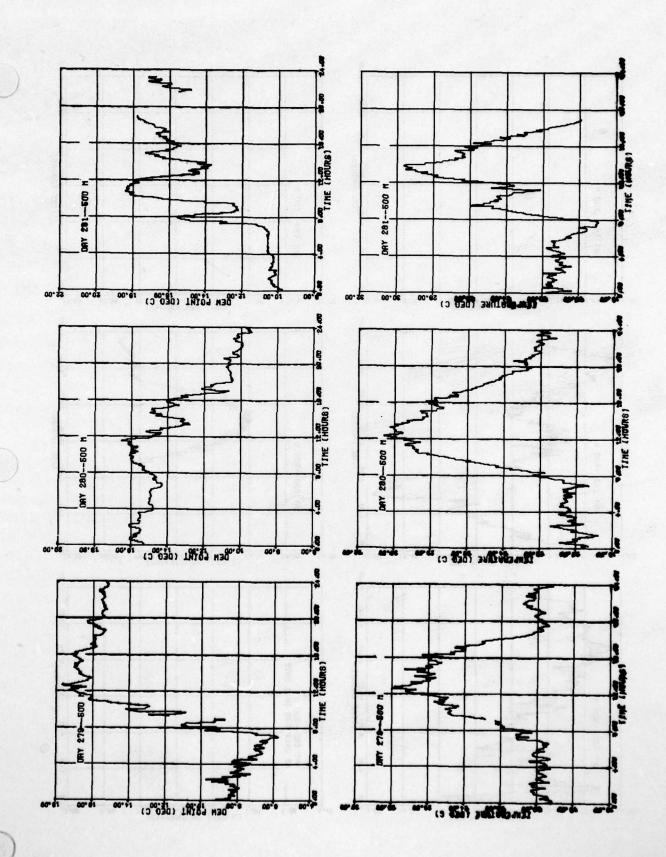


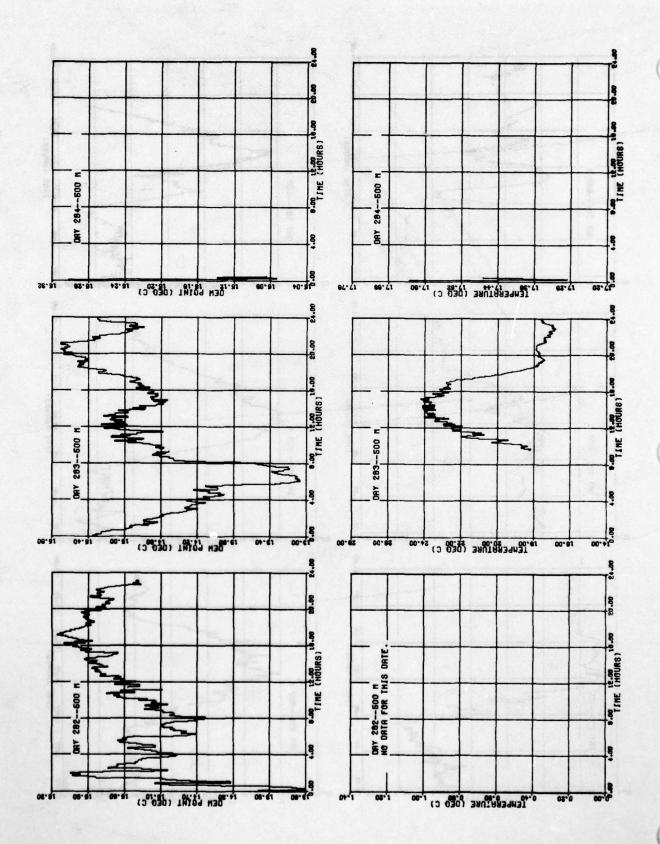


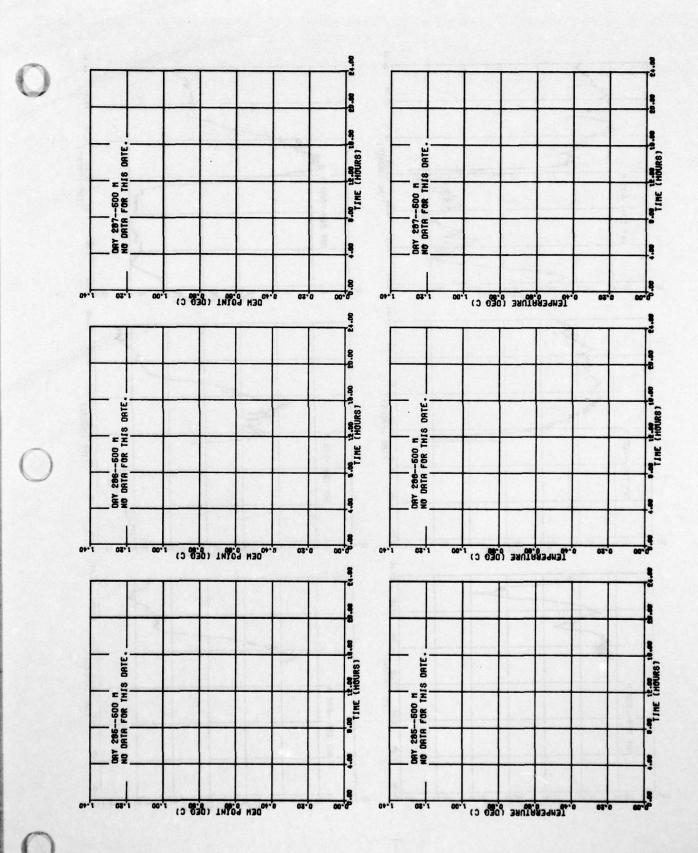


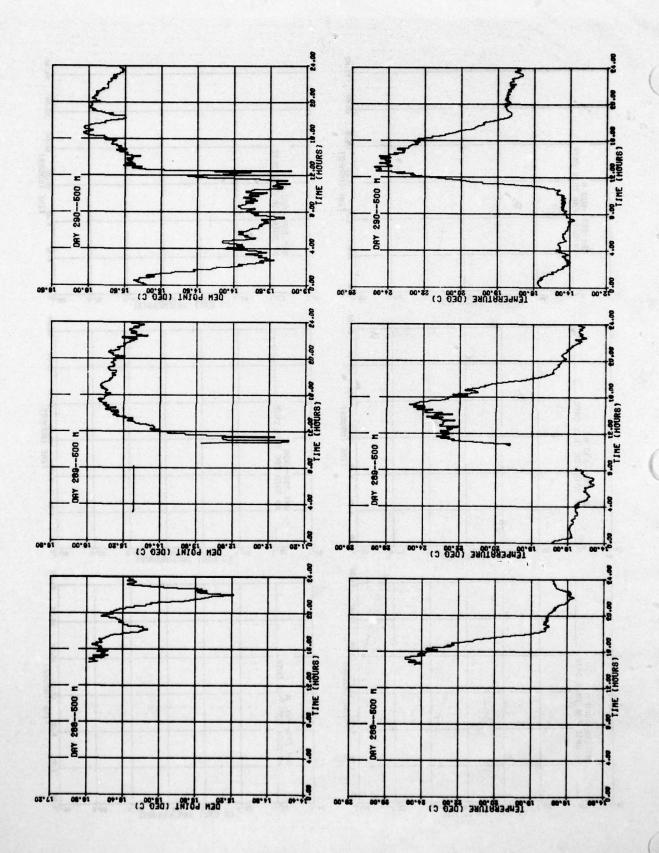


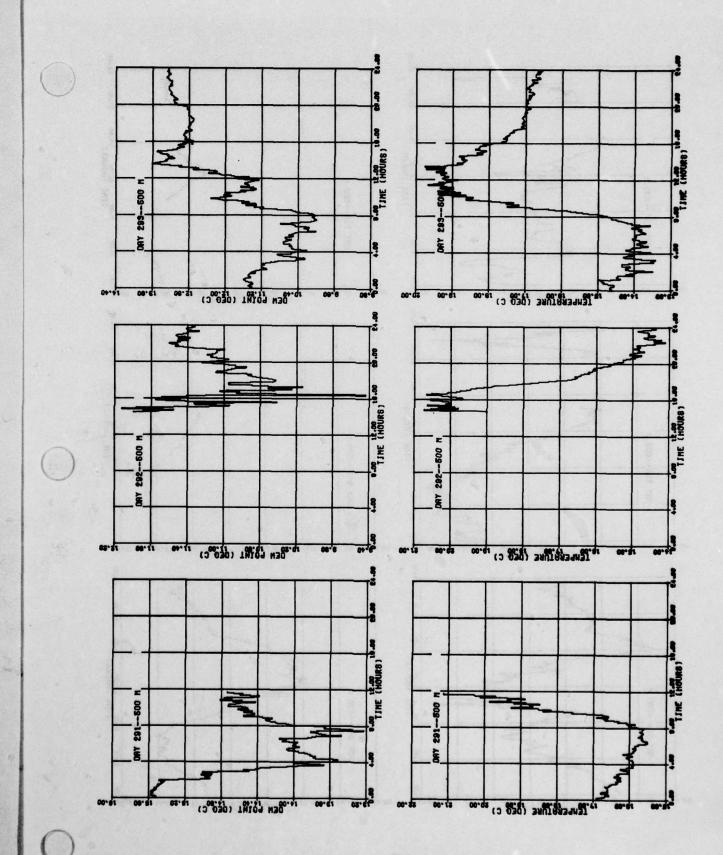


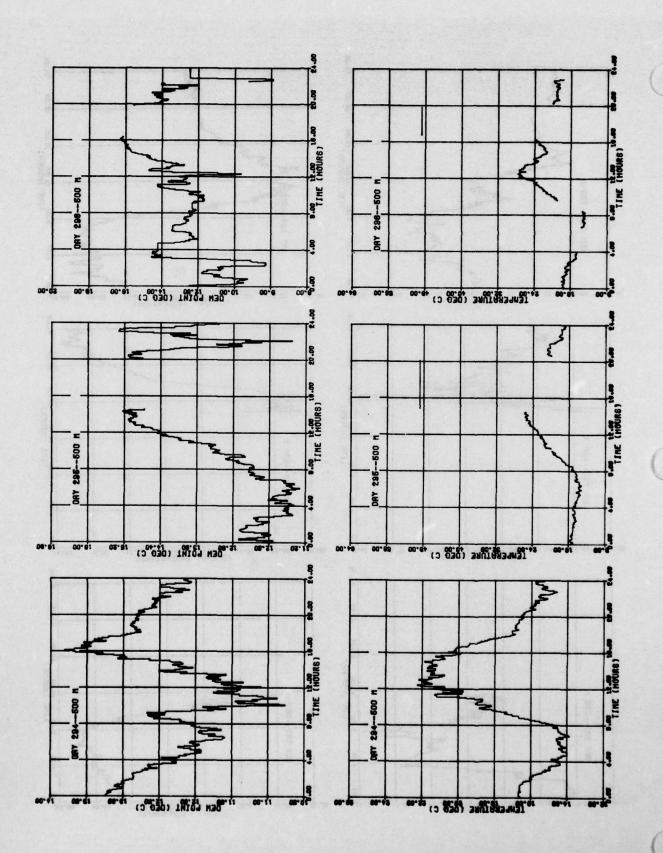


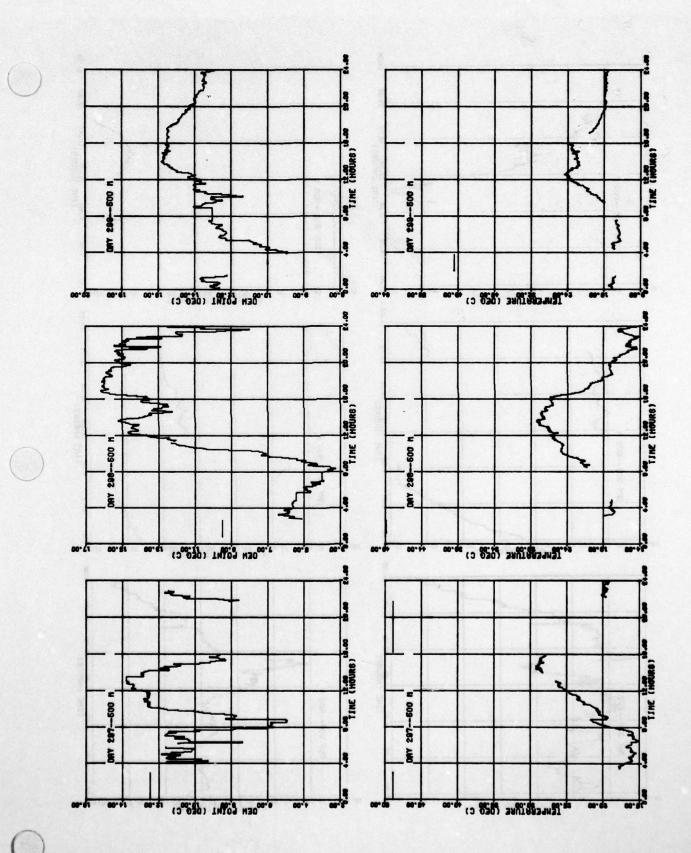


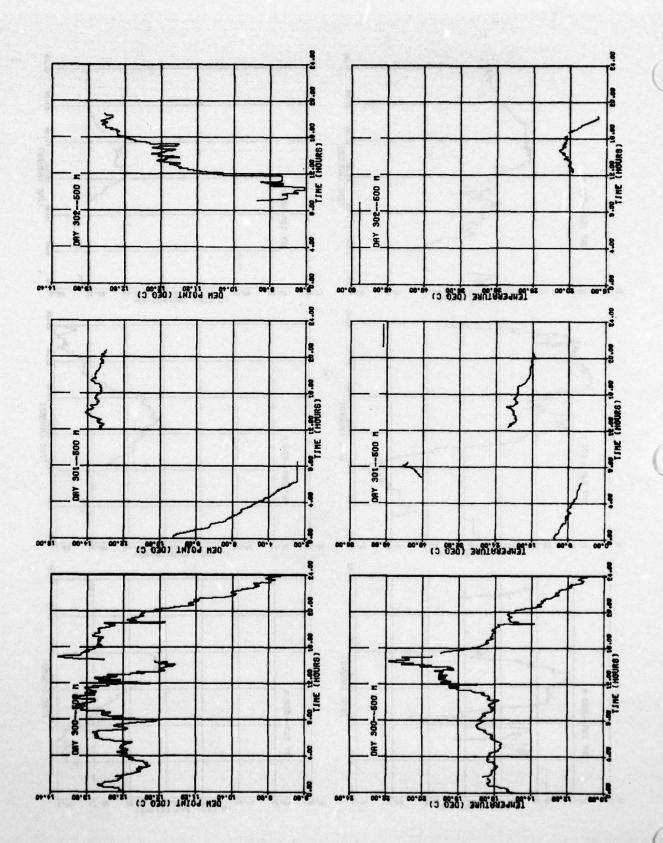


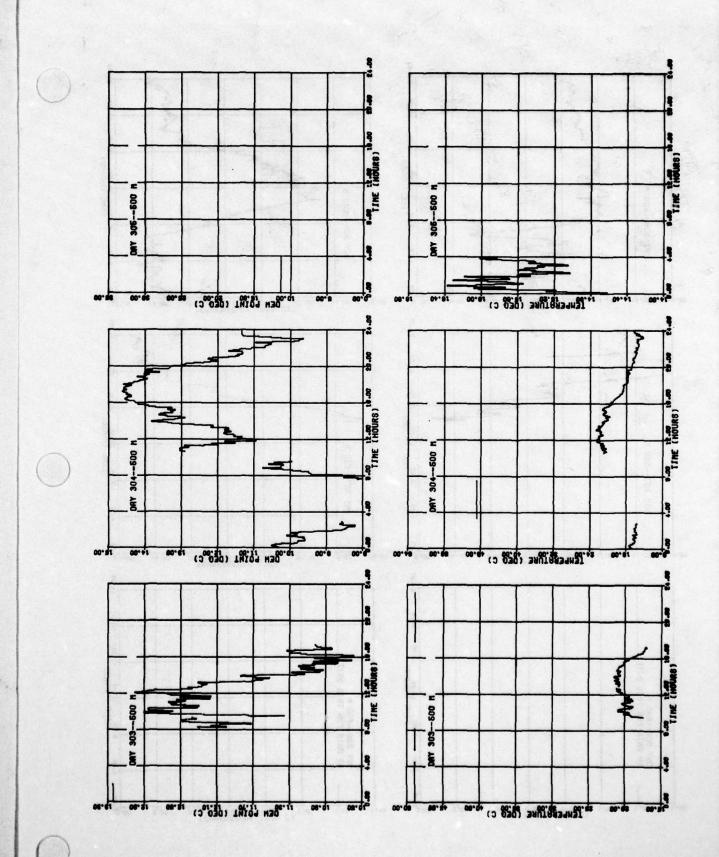


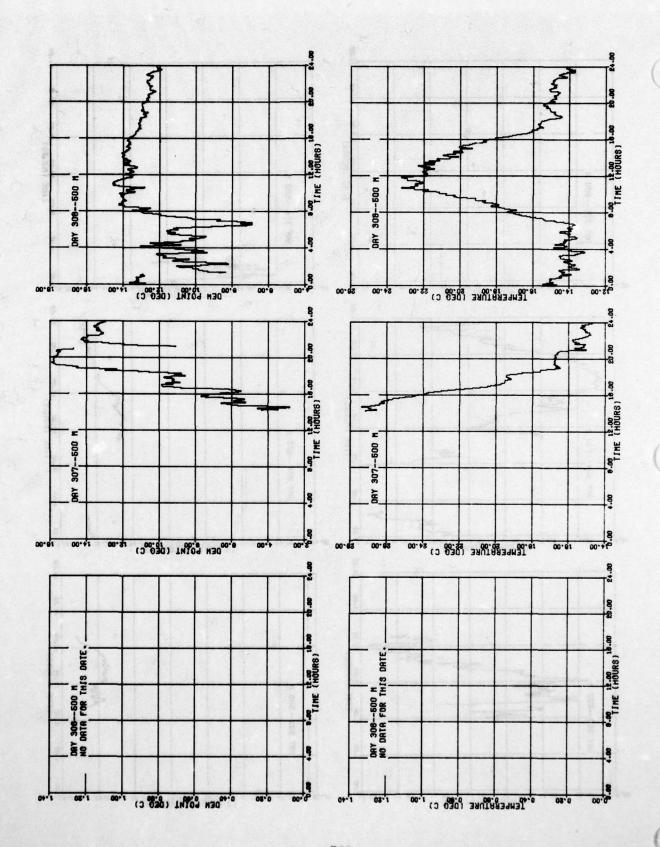


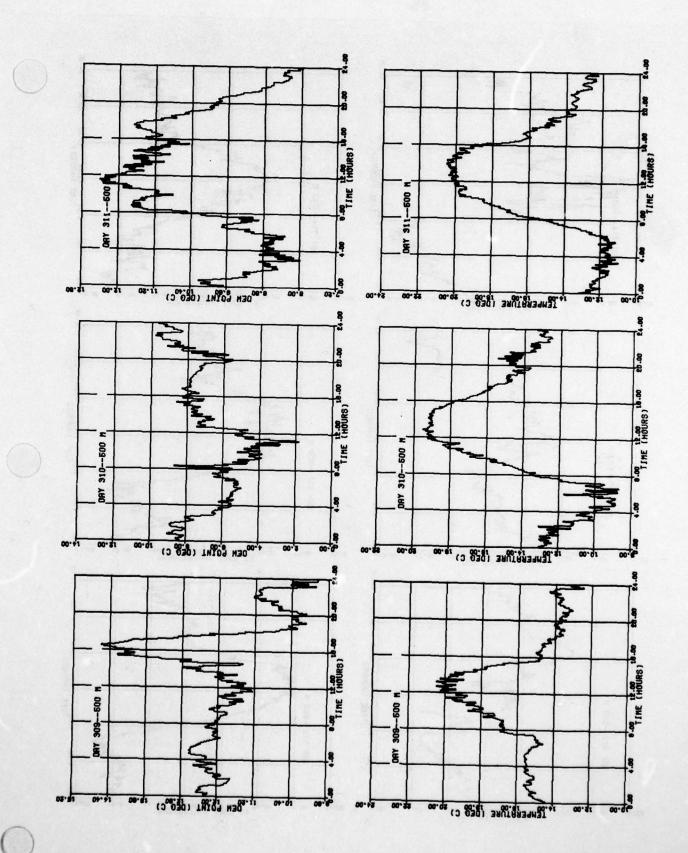


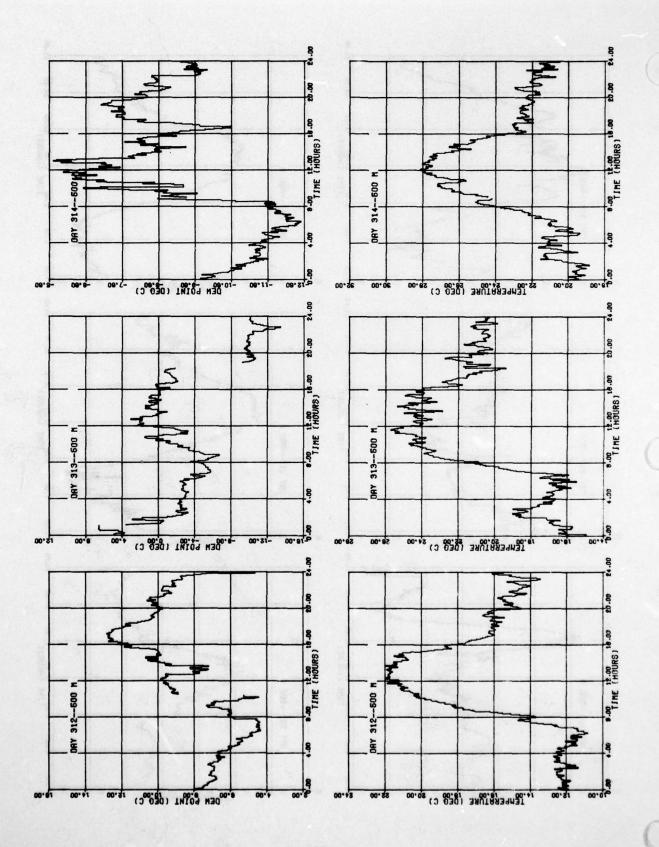


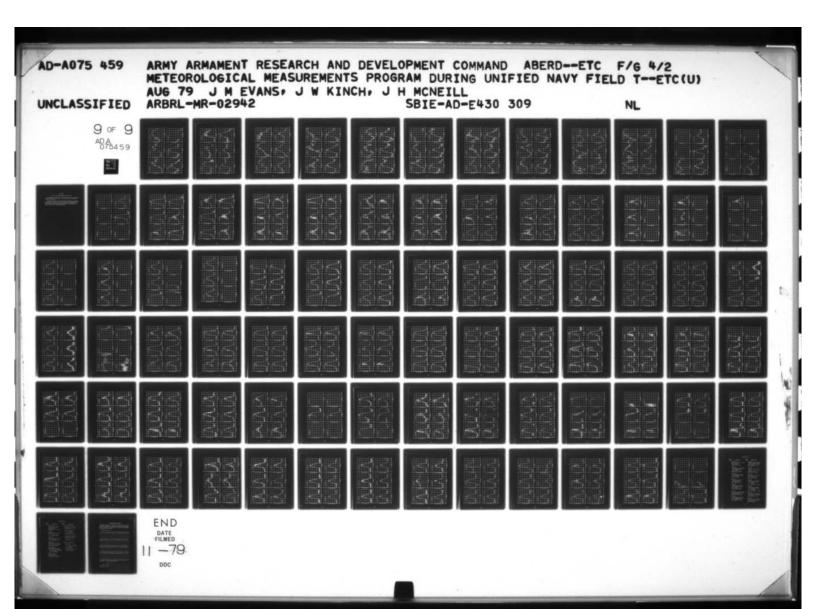


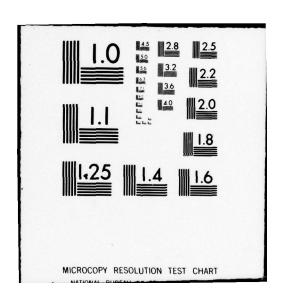


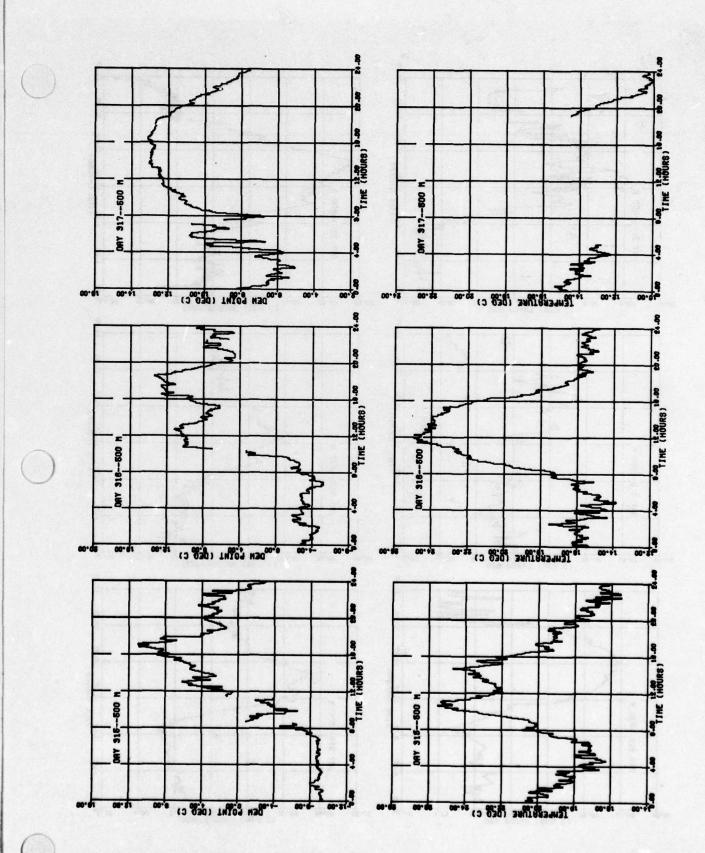


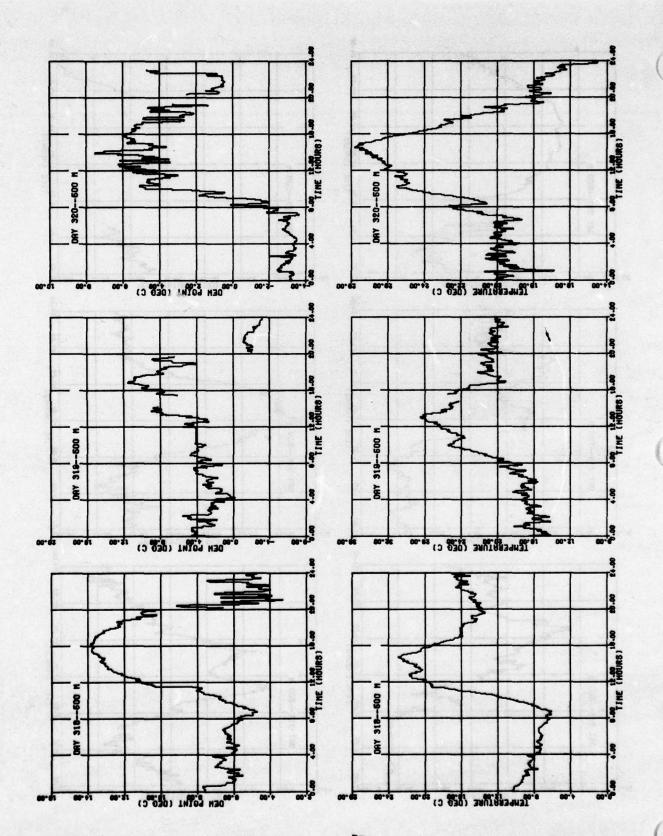


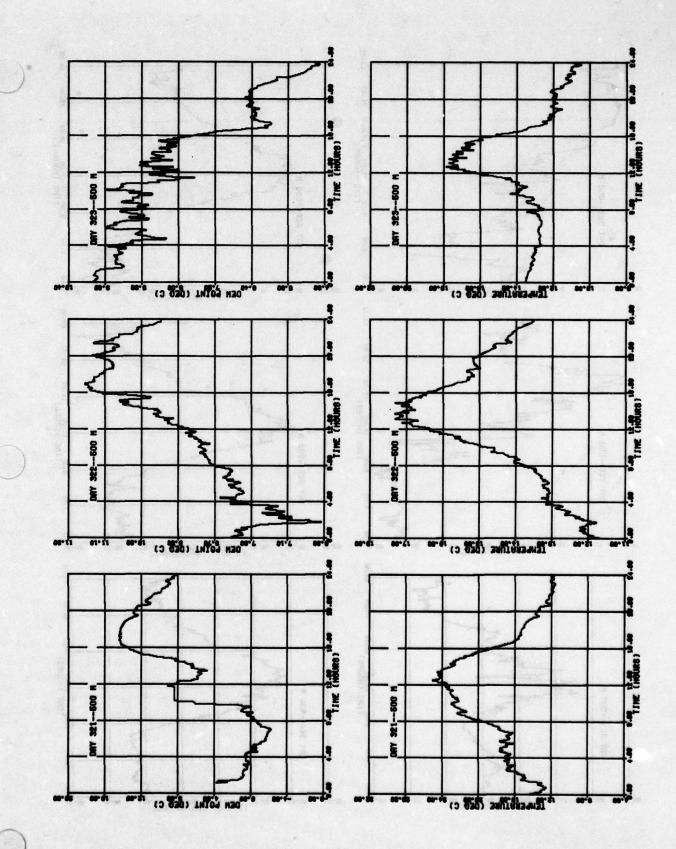


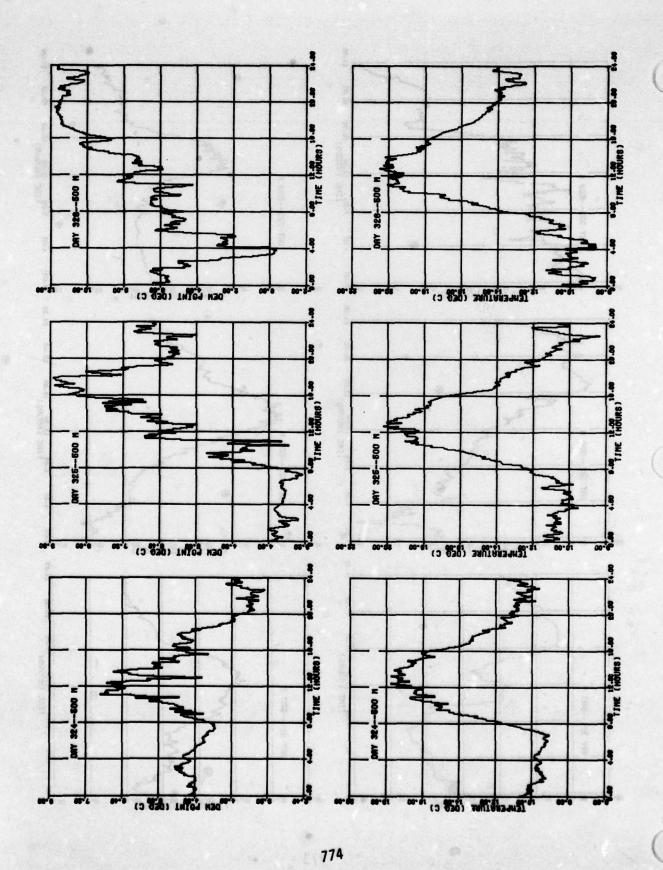


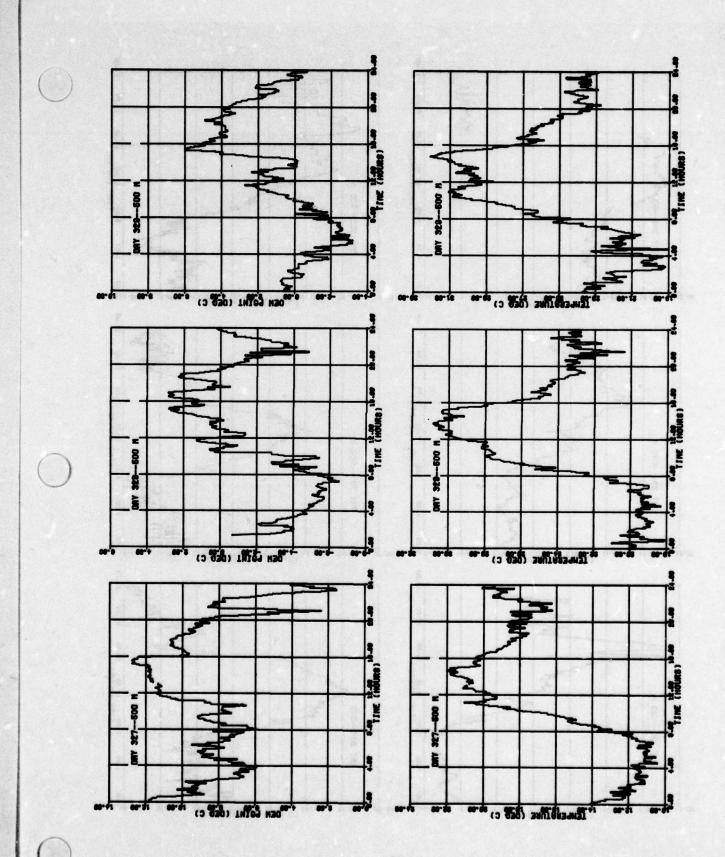


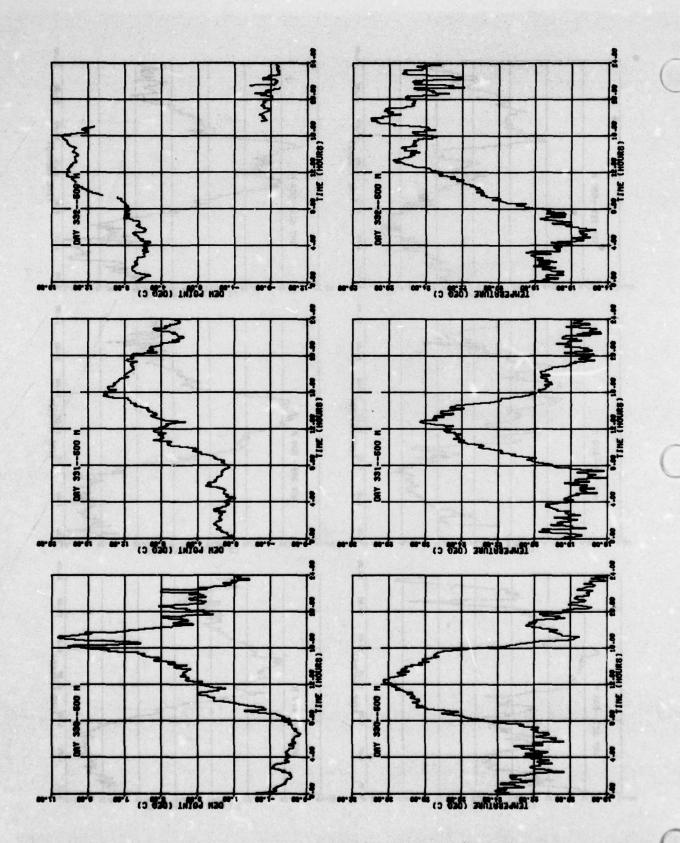


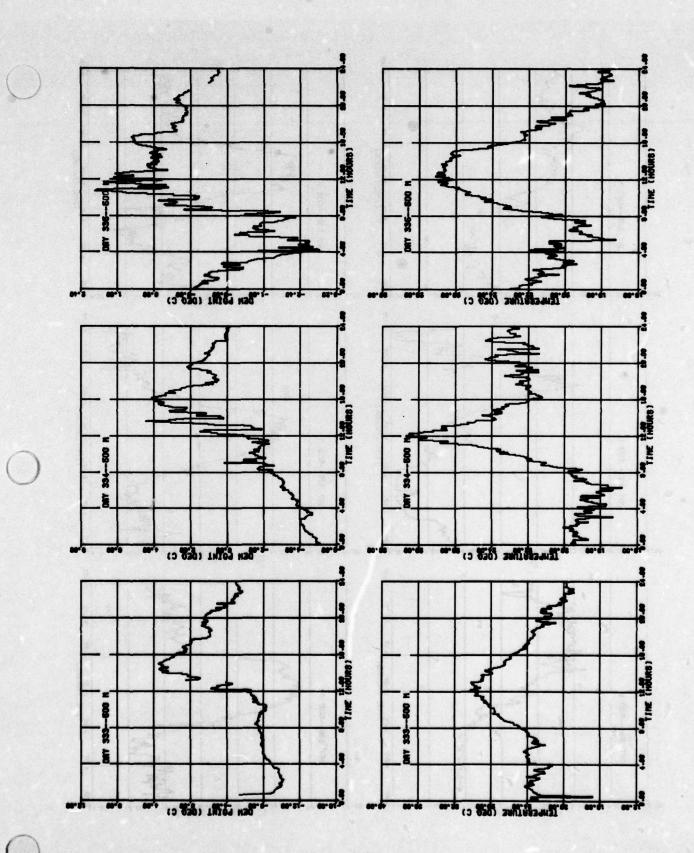


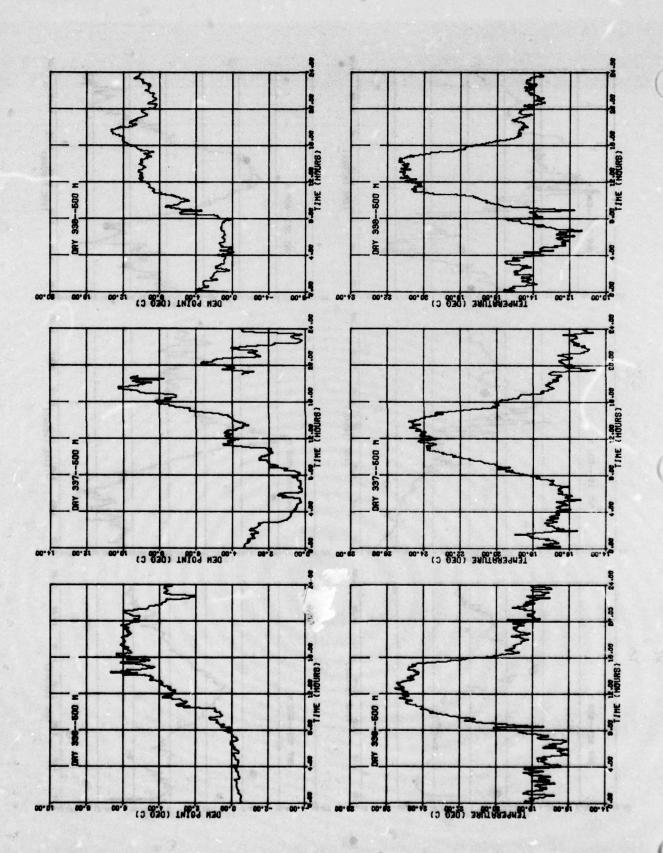


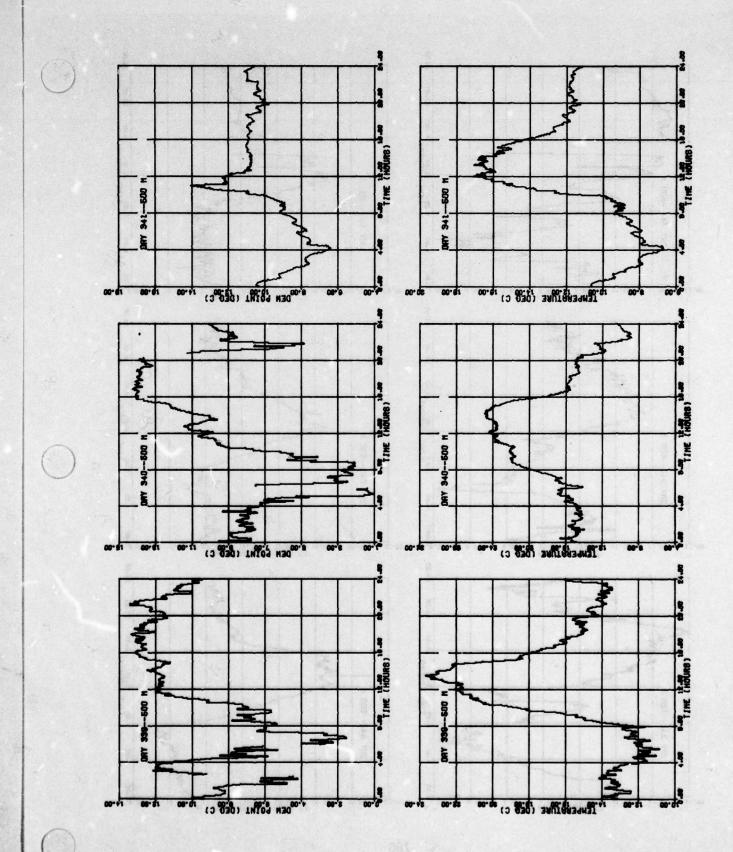


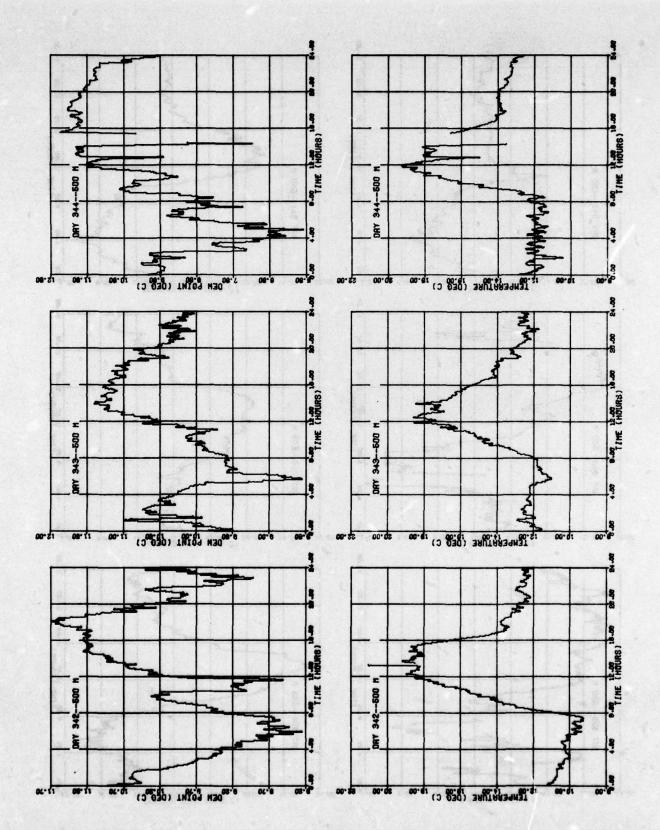


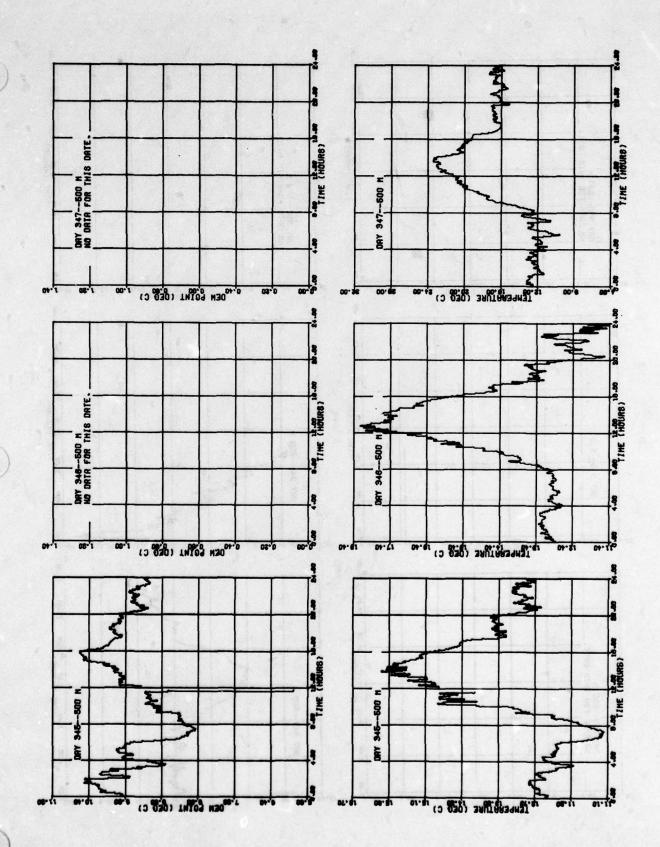


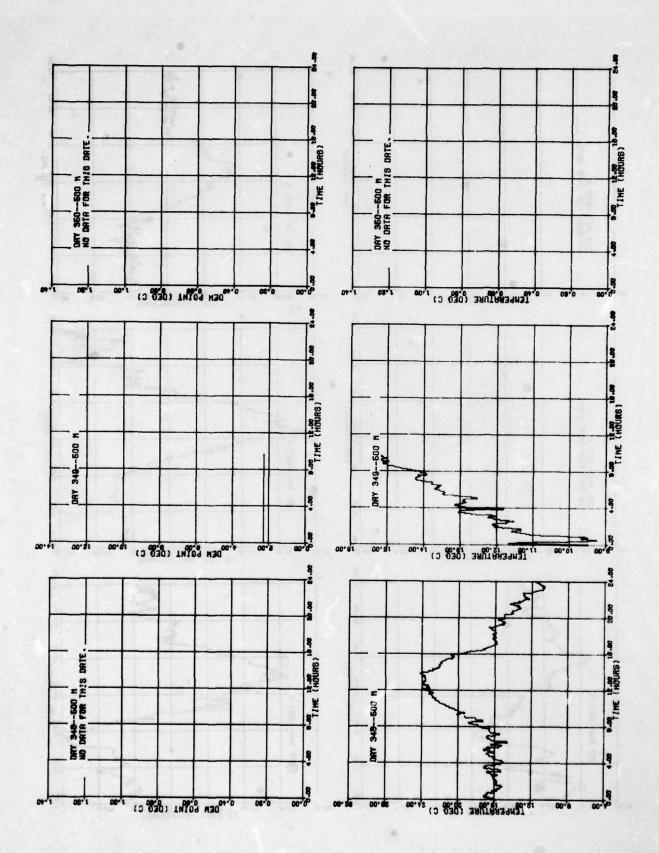










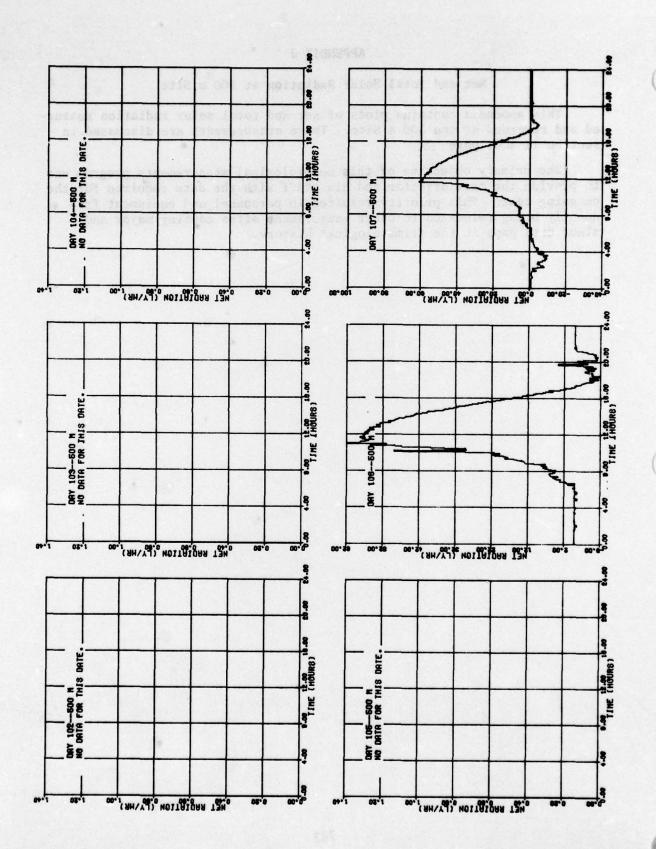


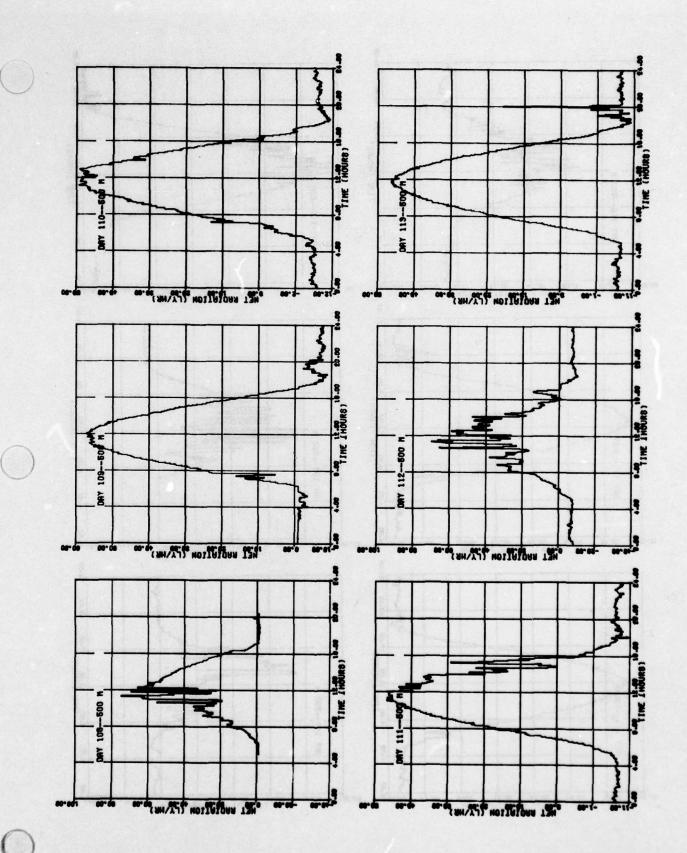
APPENDIX J

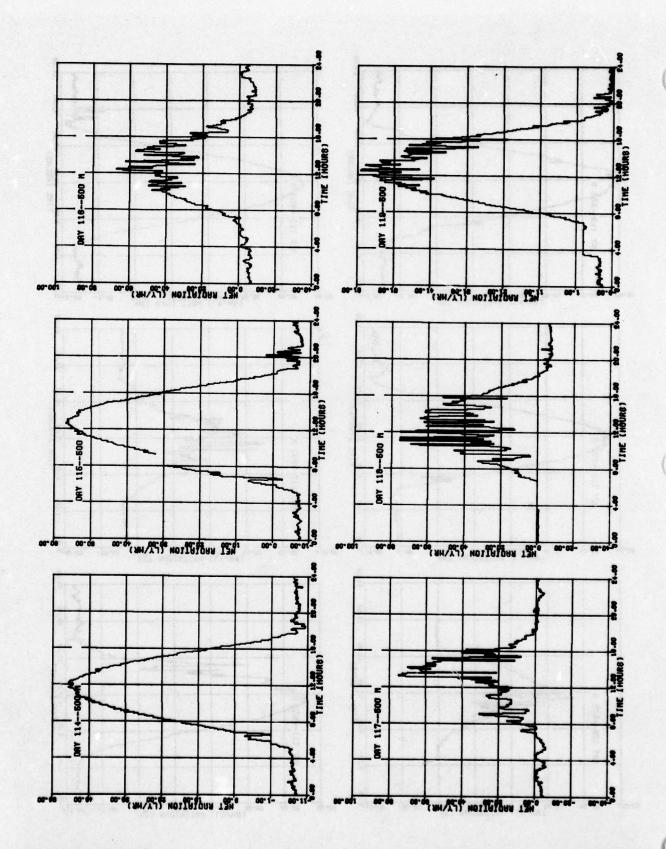
Net and Total Solar Radiation at 500 m Site

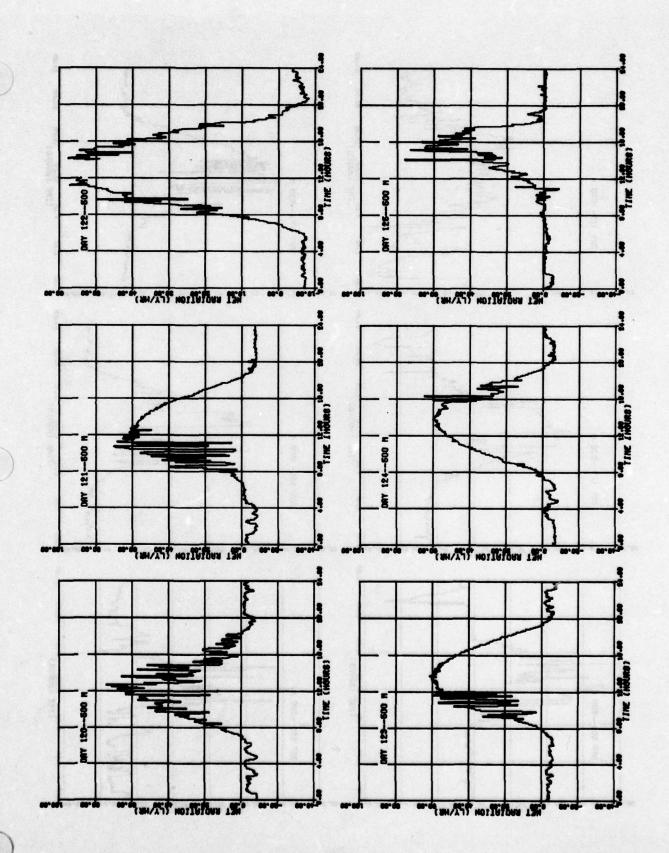
This appendix contains plots of net and total solar radiation measured and recorded at the 500 m Site. These measurements are discussed in section II 86, page 13.

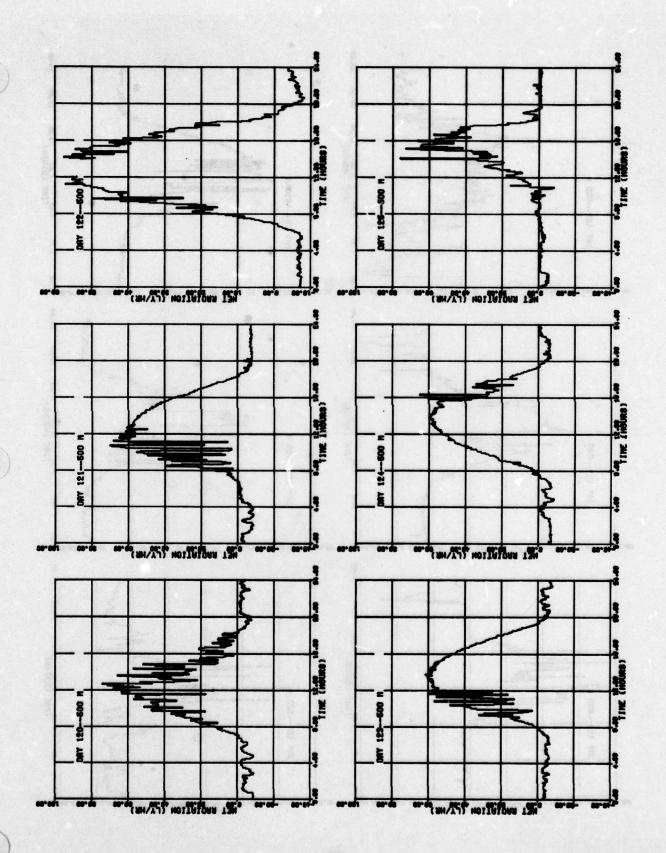
The primary objective of this meterological measurements program was to provide the test director and his staff with the data required for the on going test. This priority resulted in personnel and equipment frequently being relocated to other measurement sites causing major and minor data gaps in the climatological history.

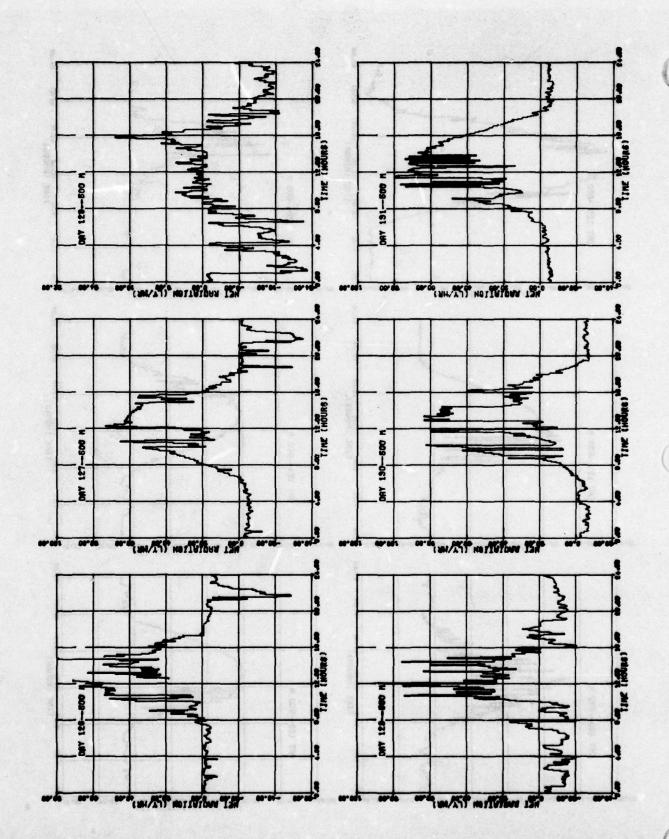


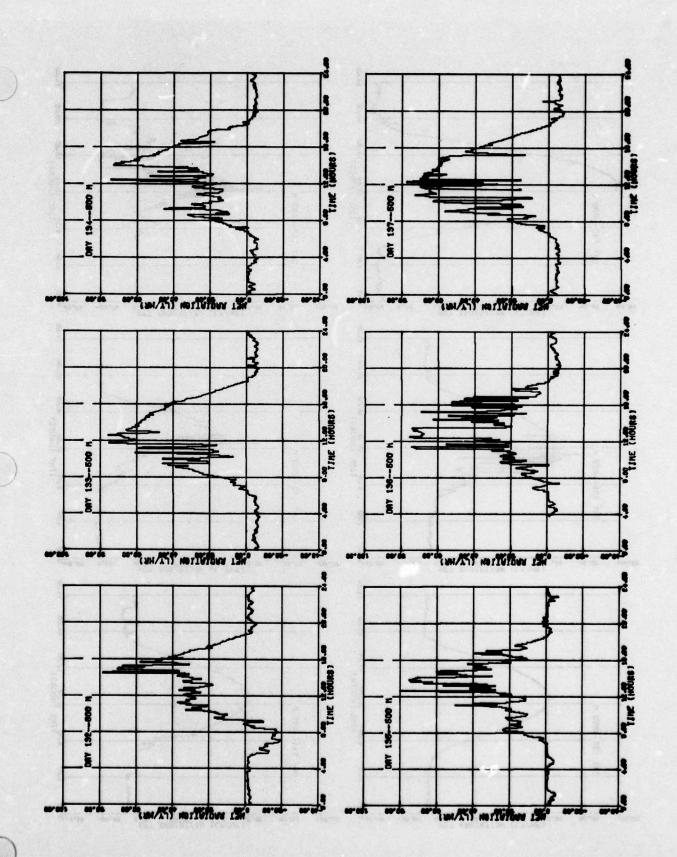


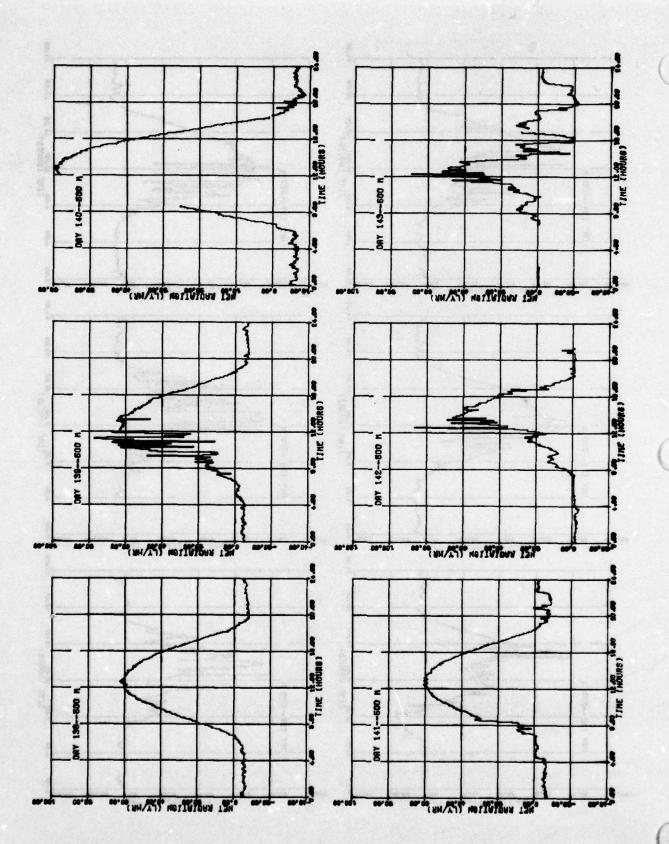


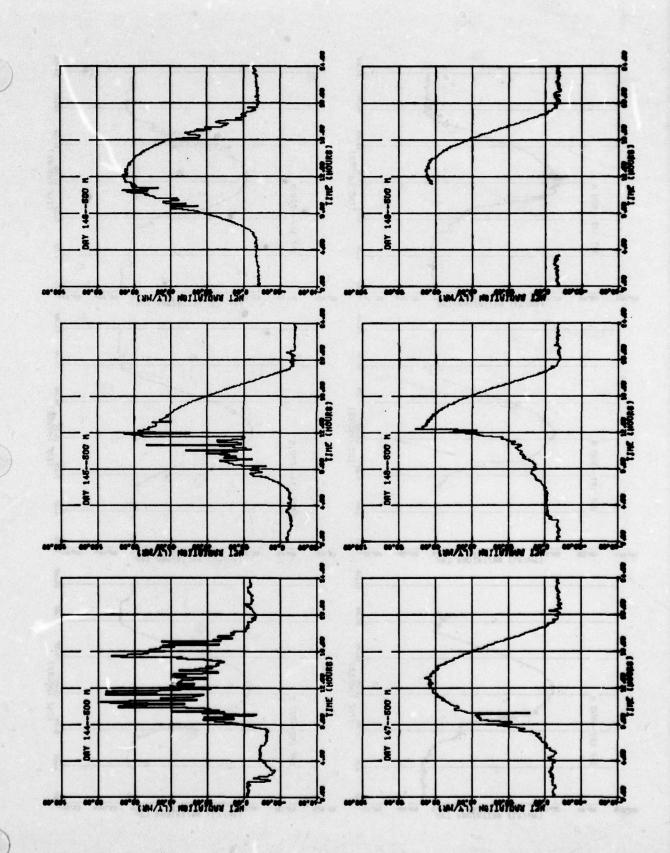


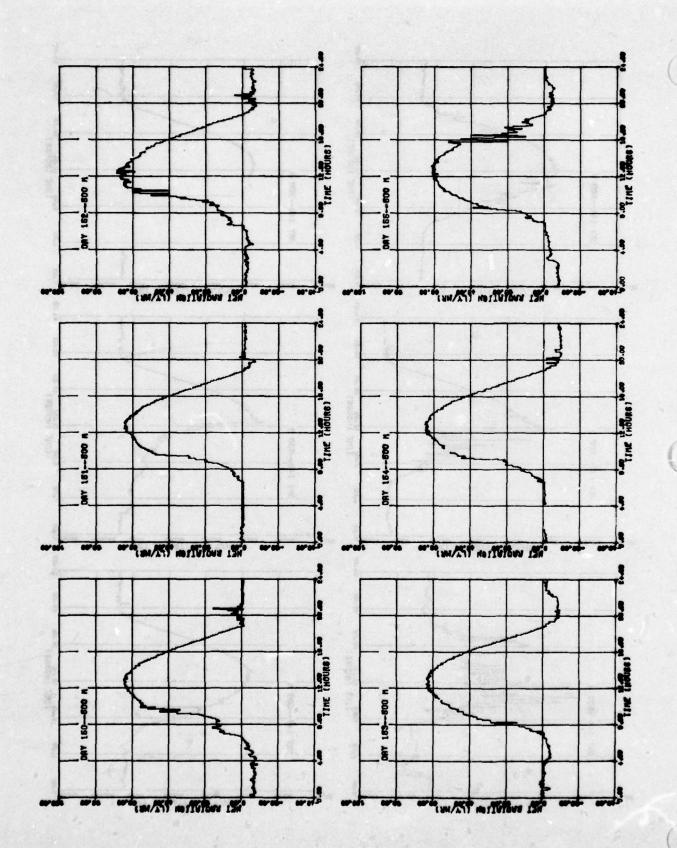


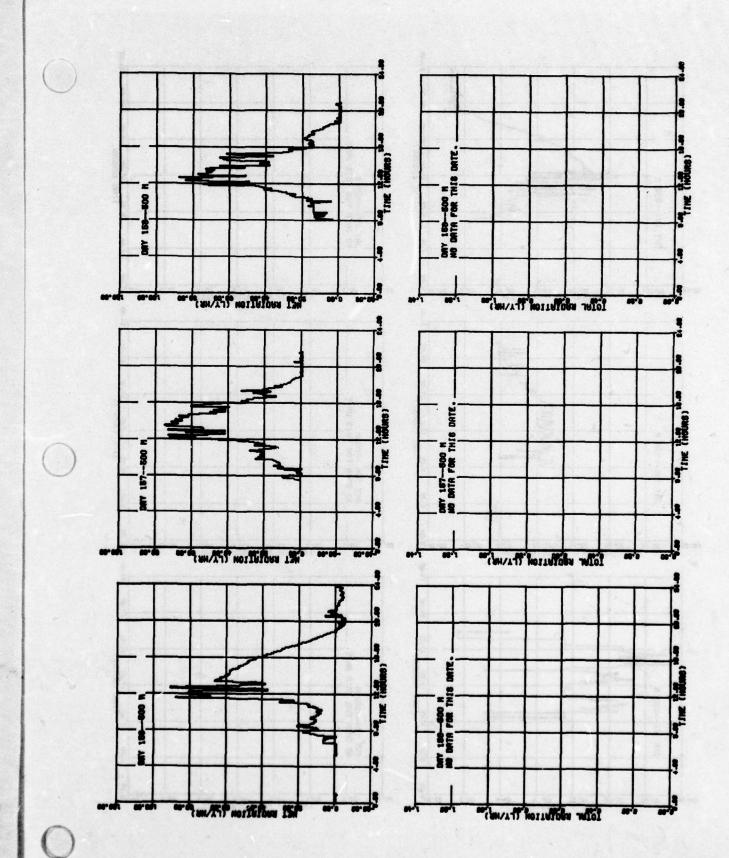


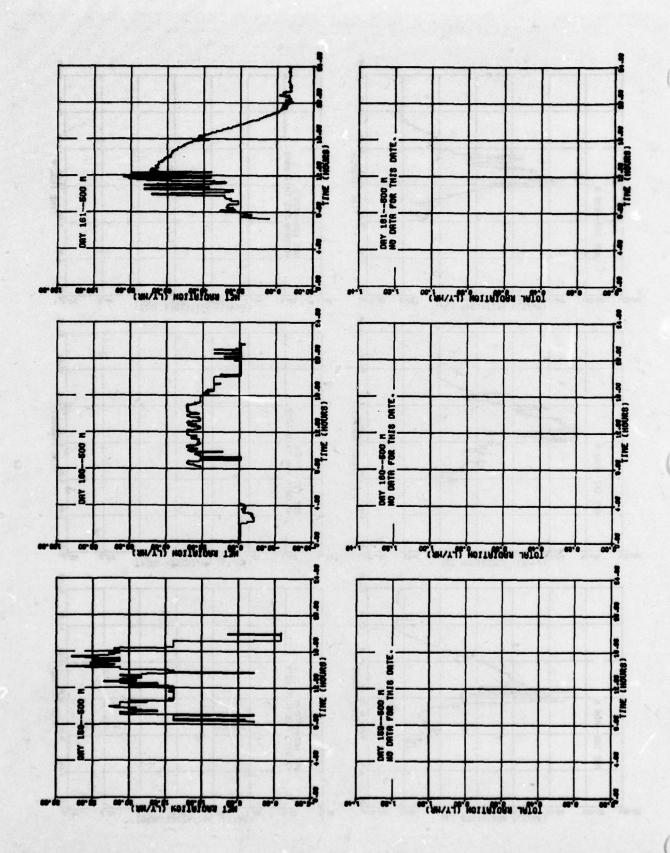


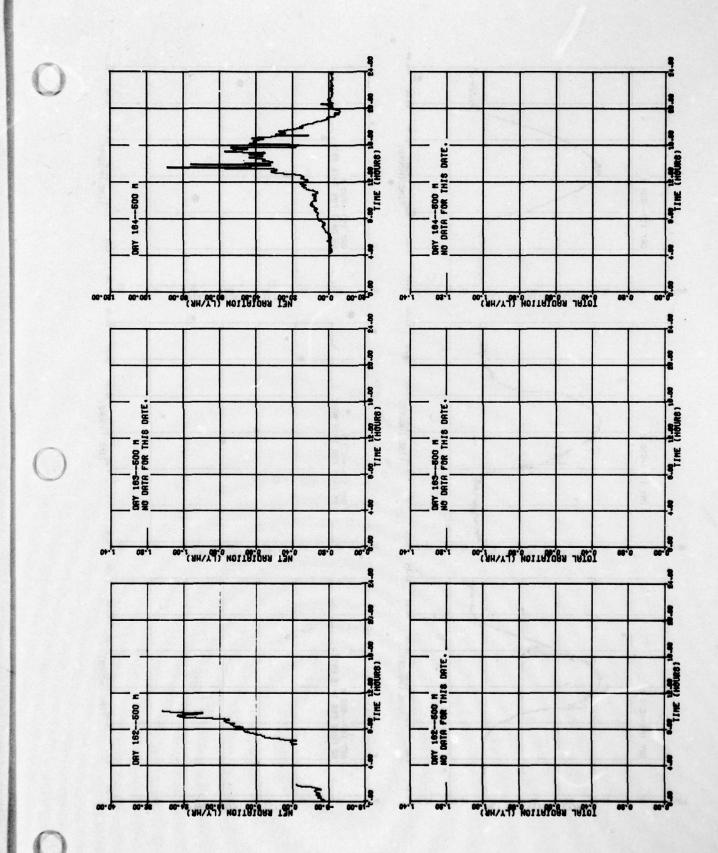


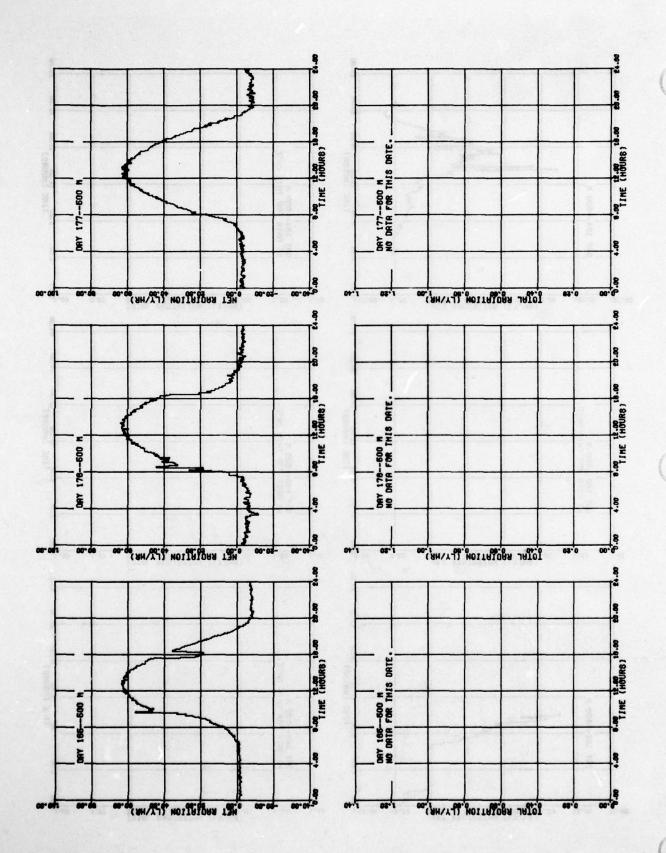


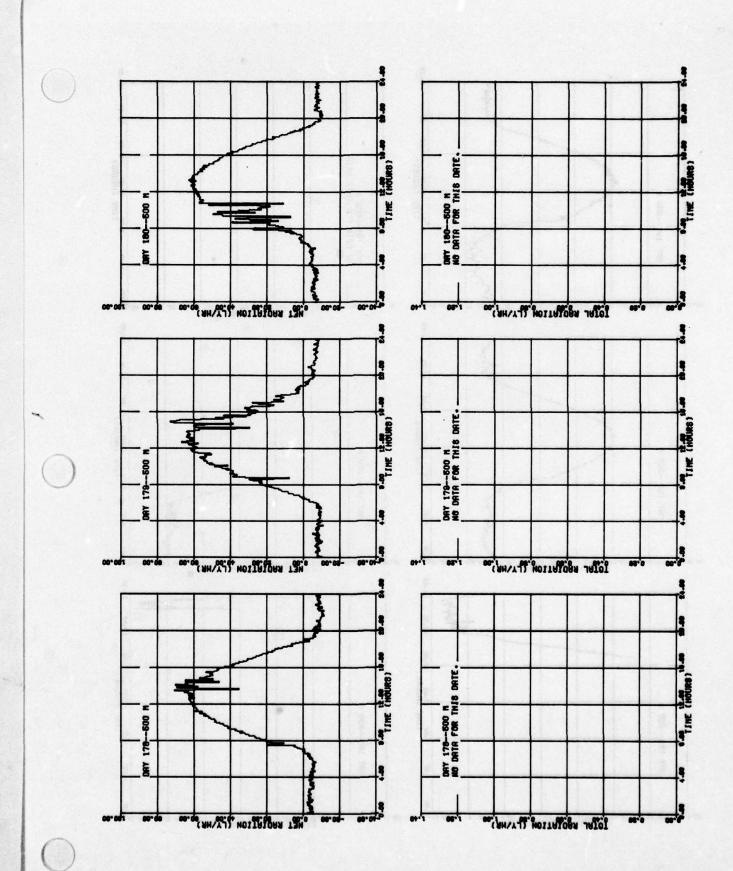


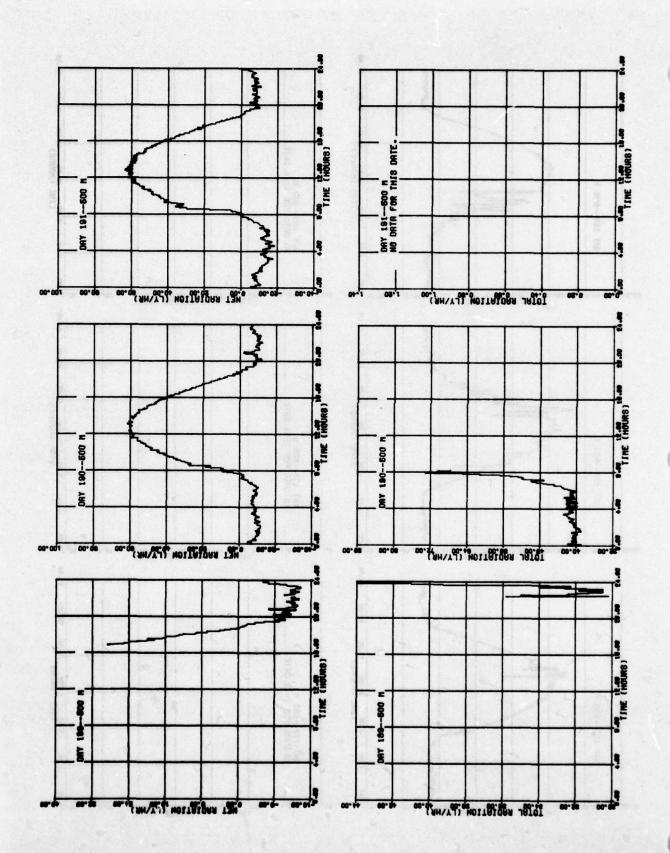


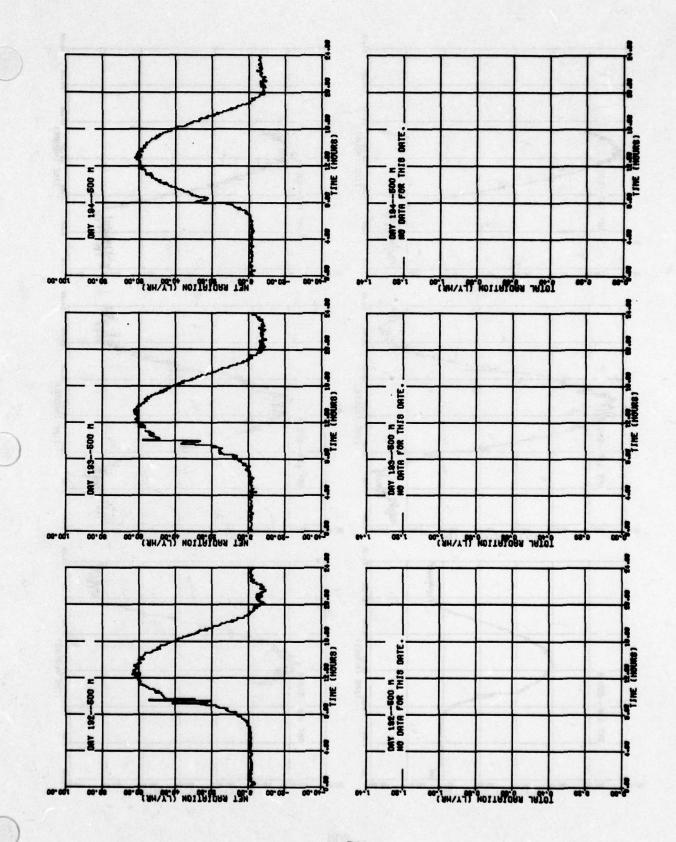


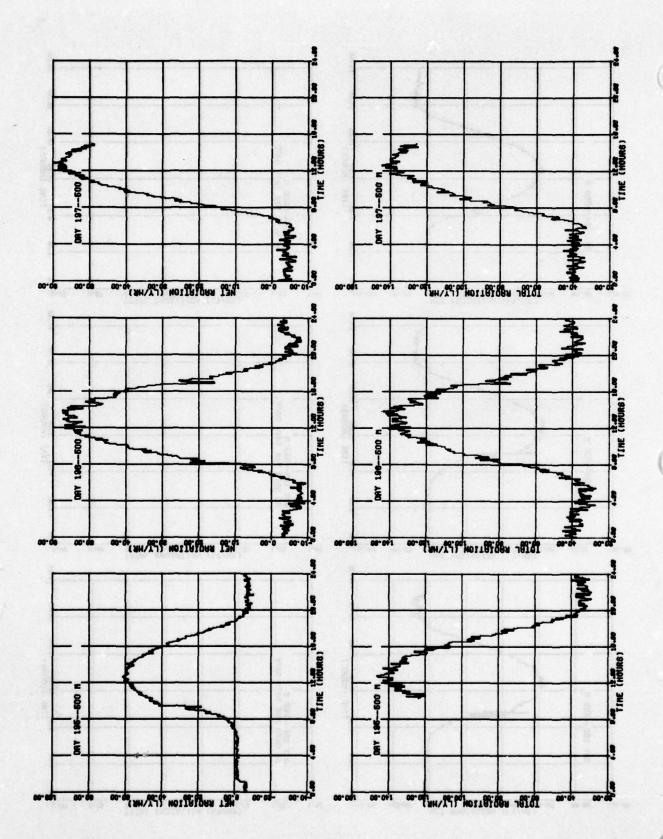


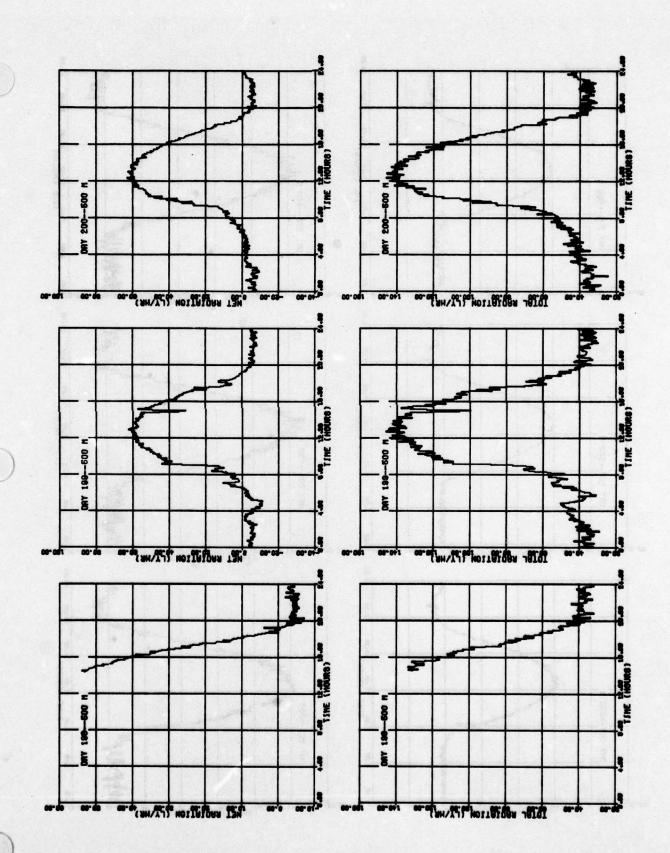


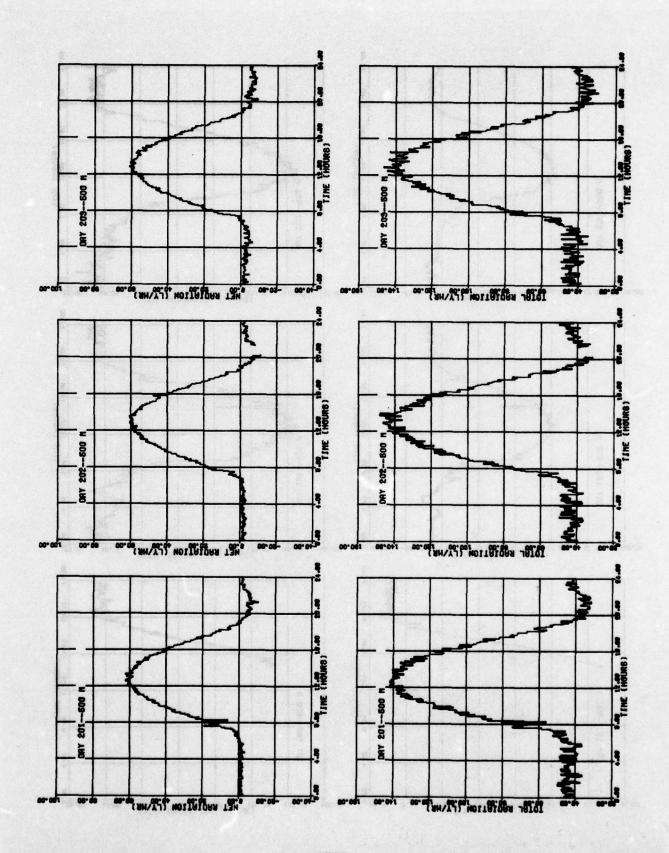


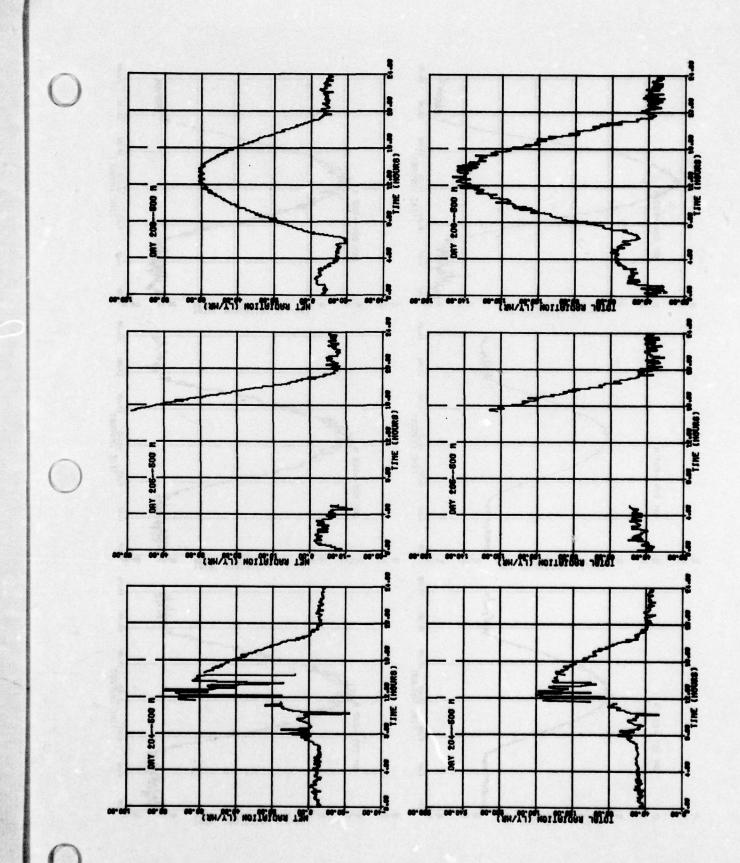


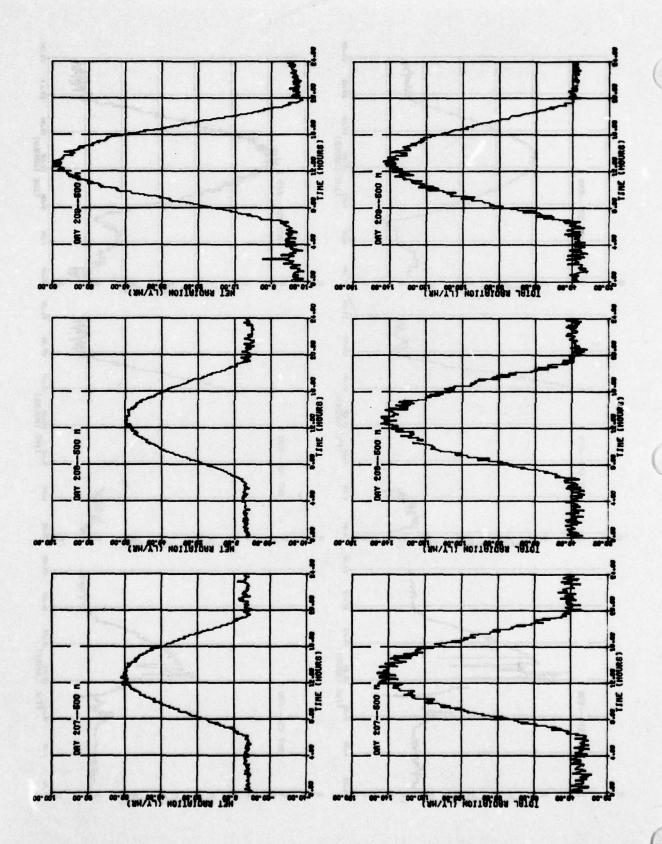


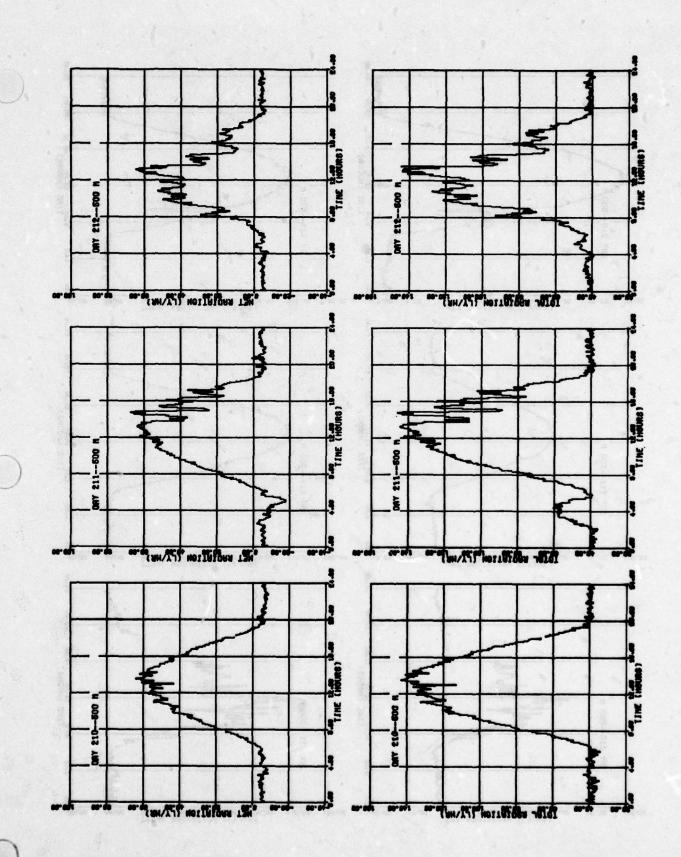


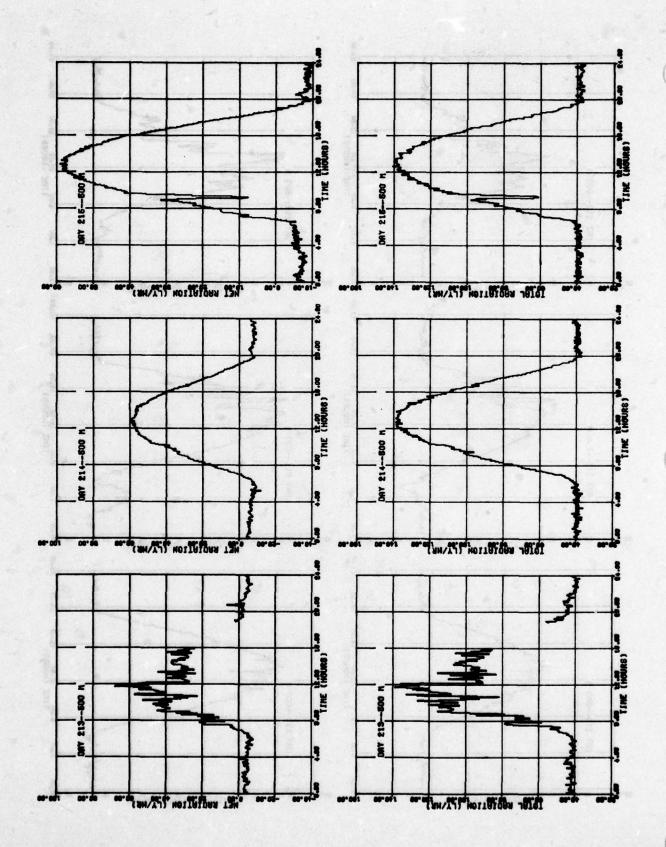


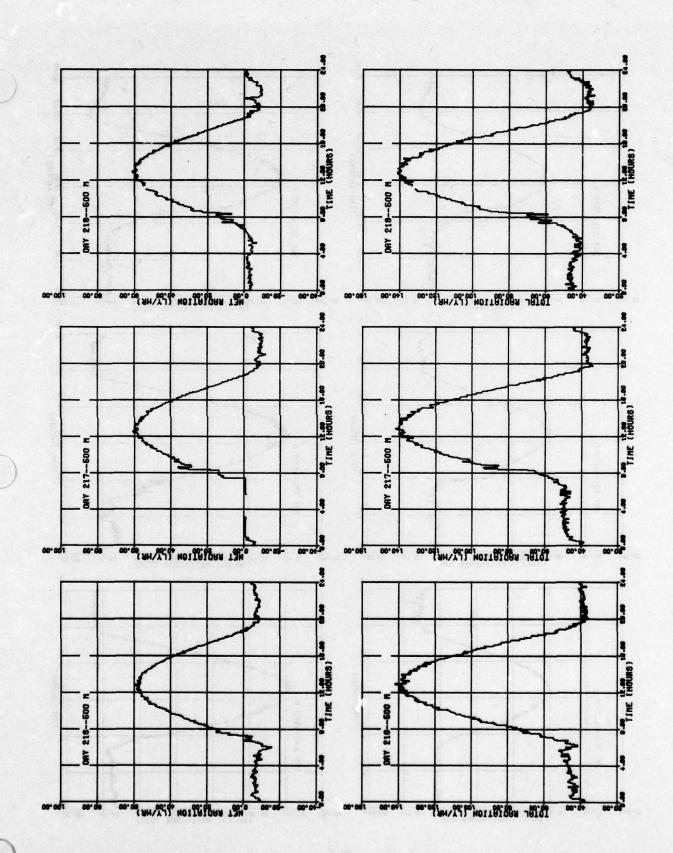


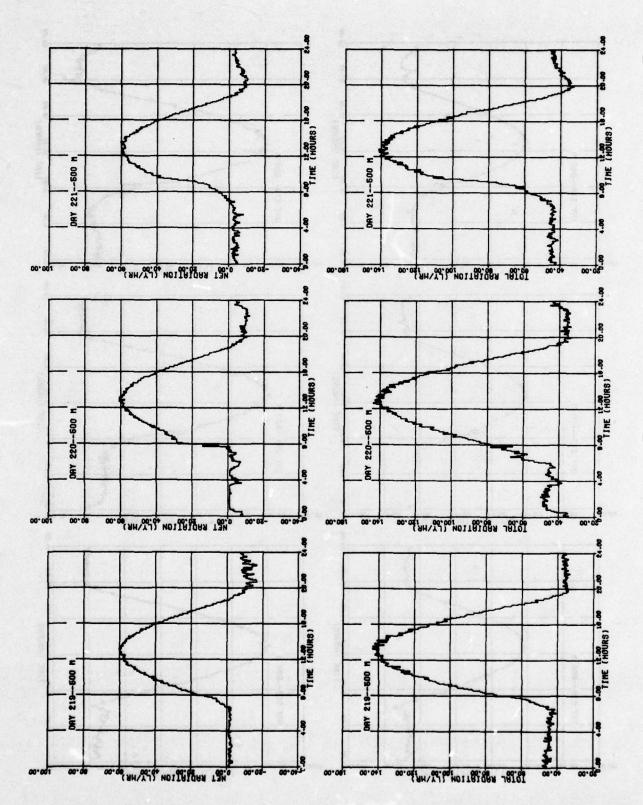


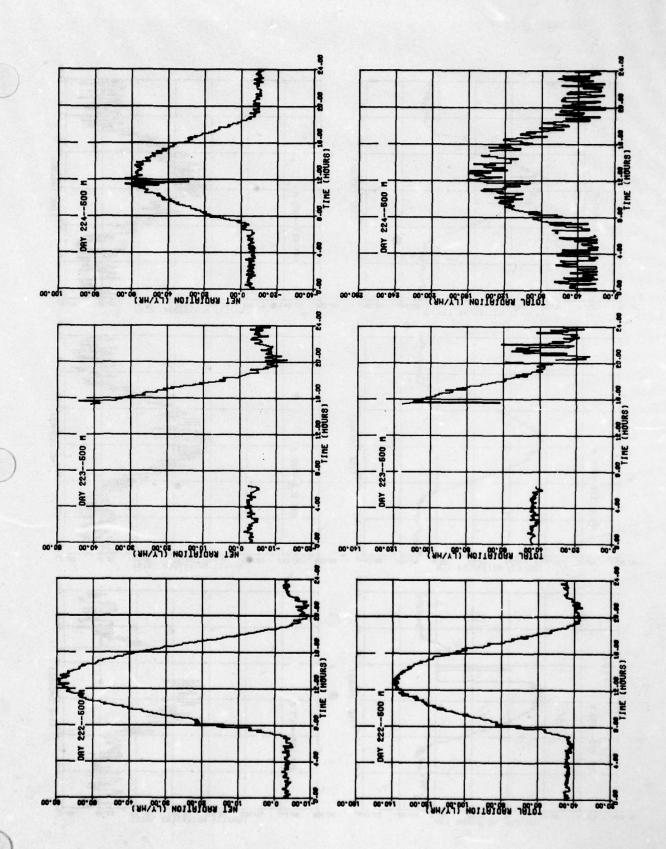


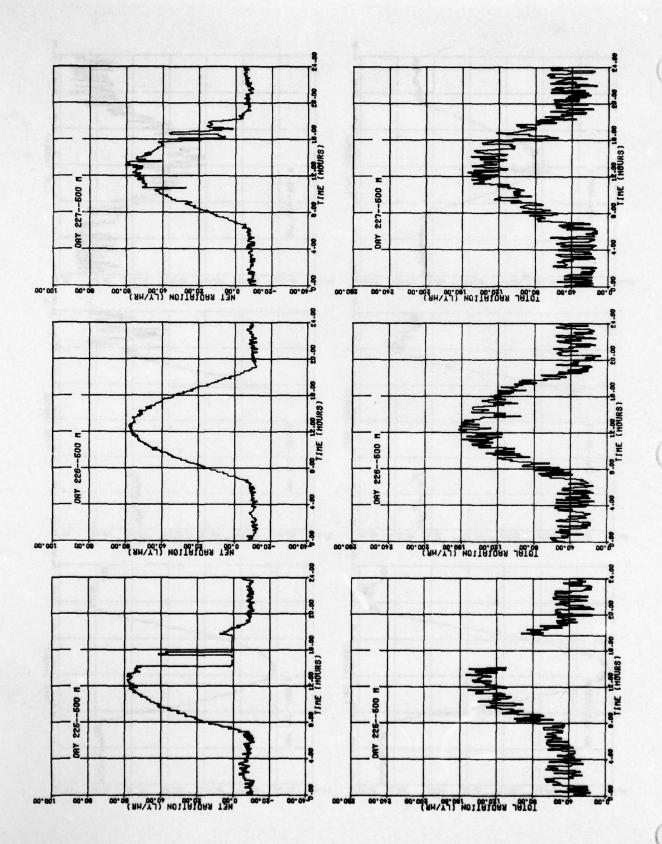


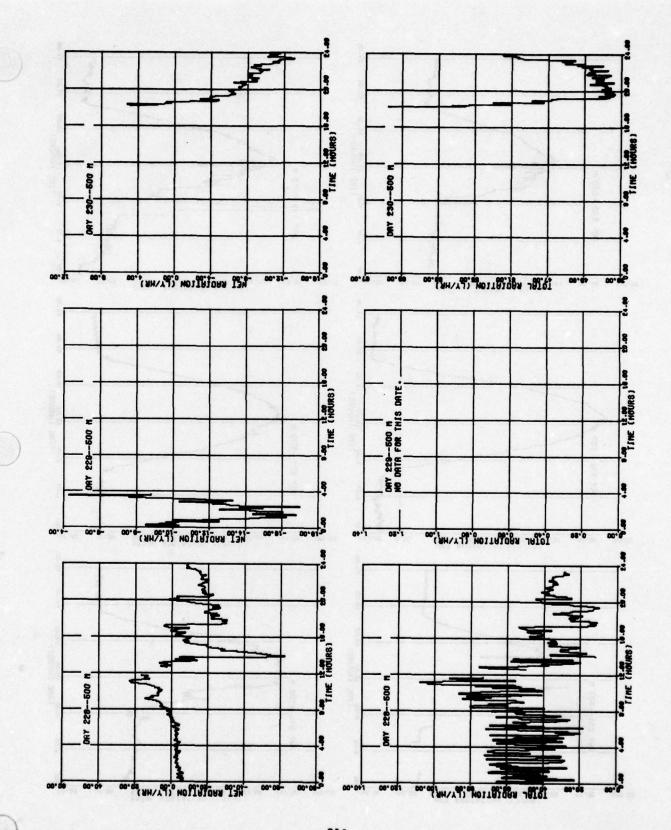


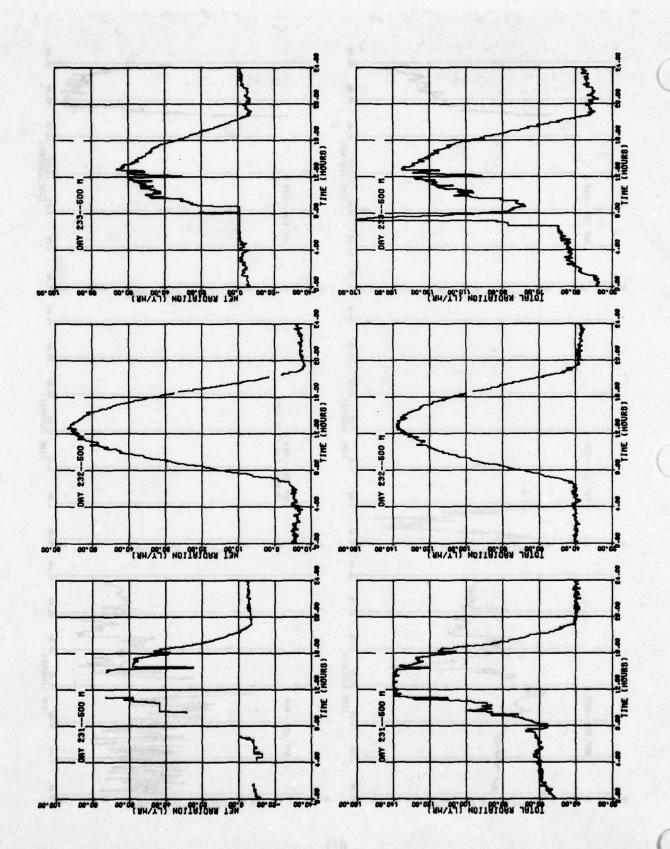


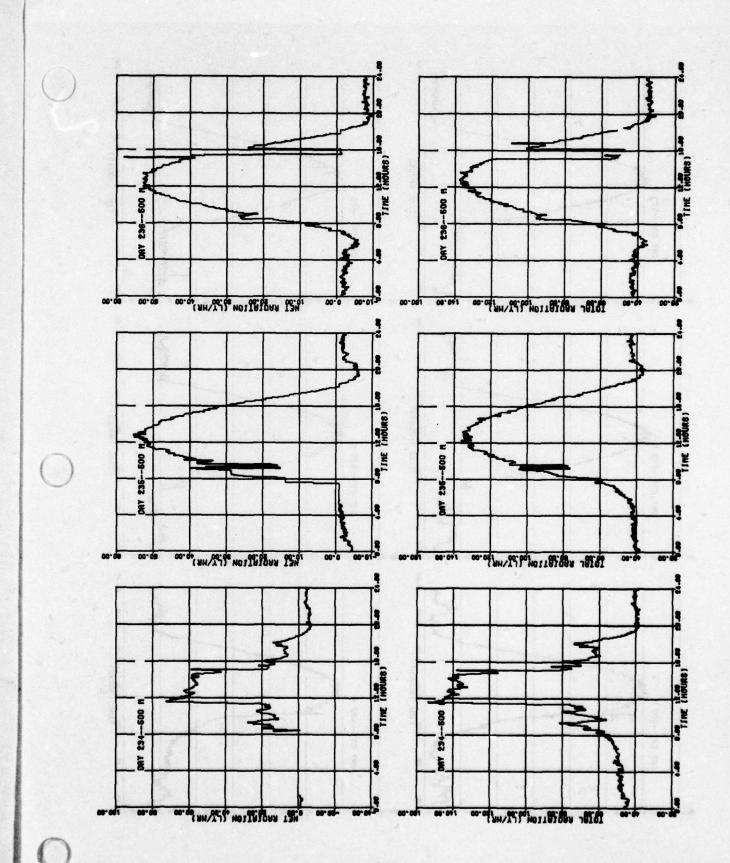


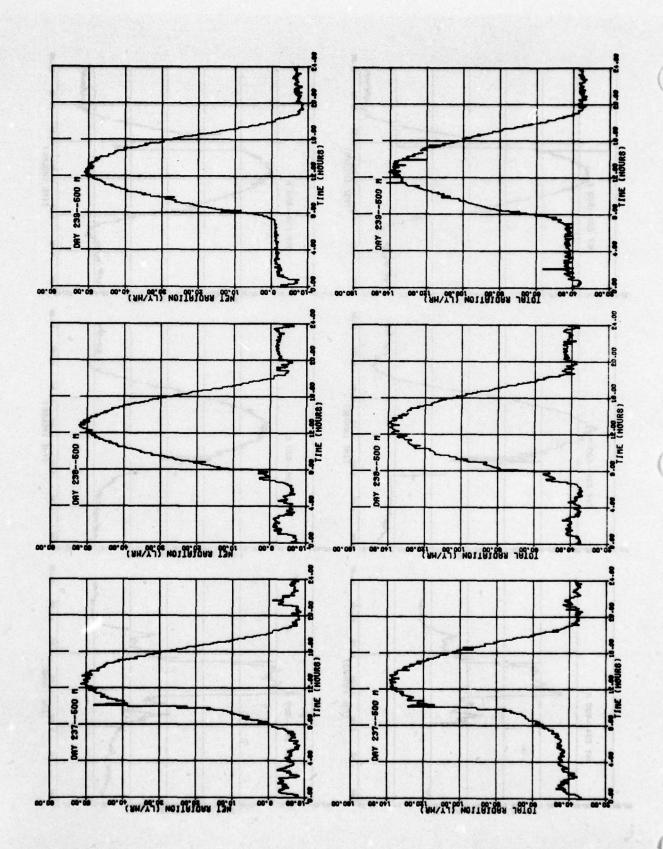


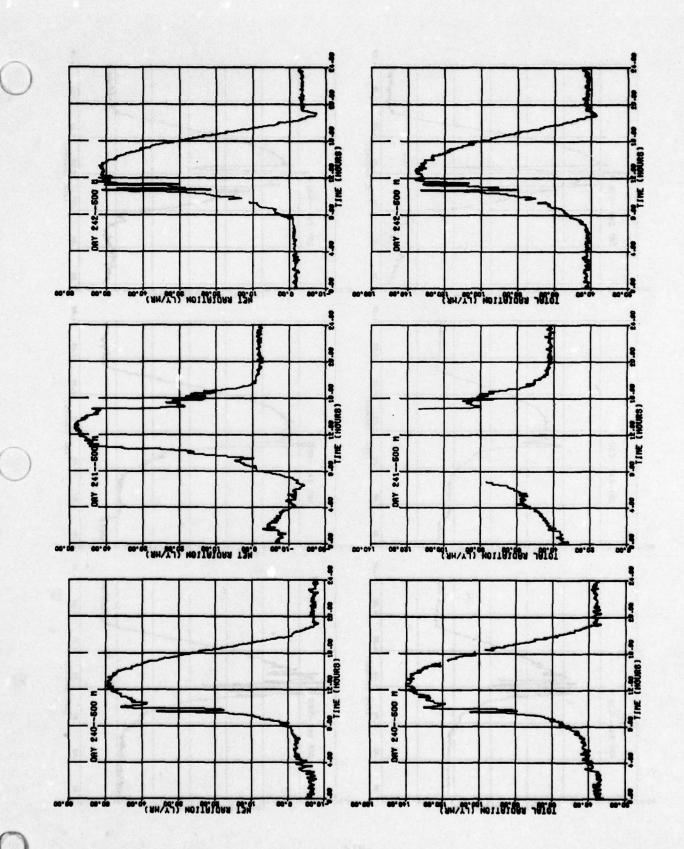


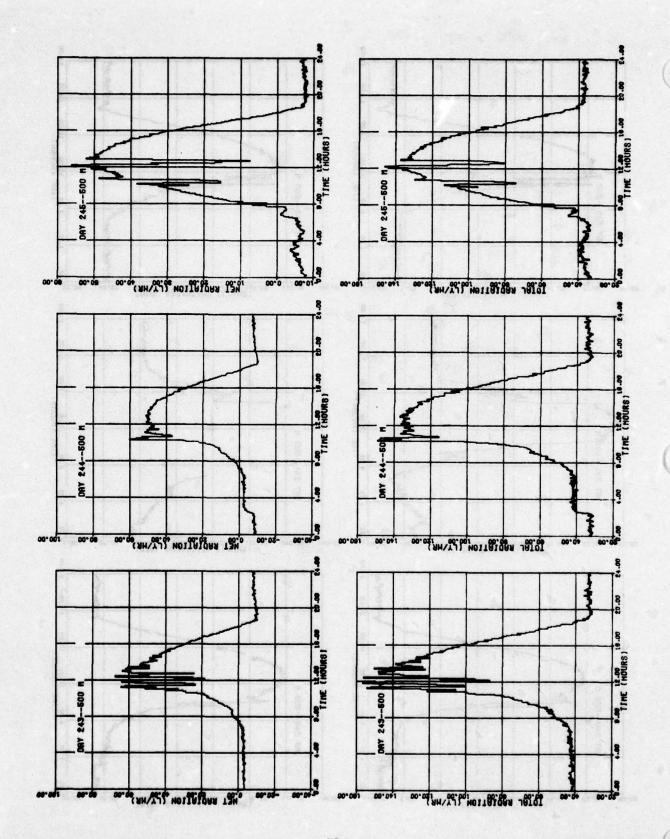


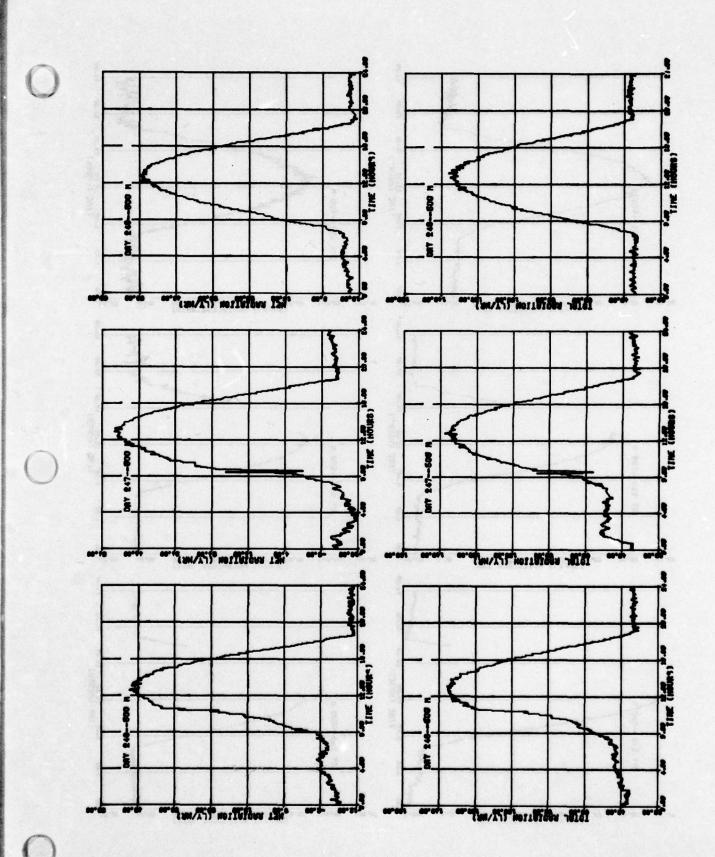


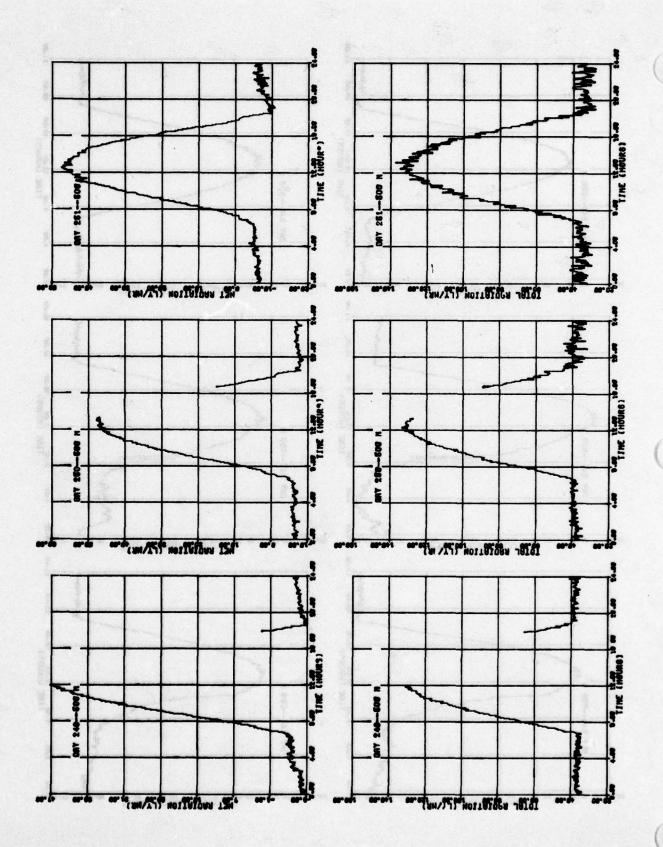


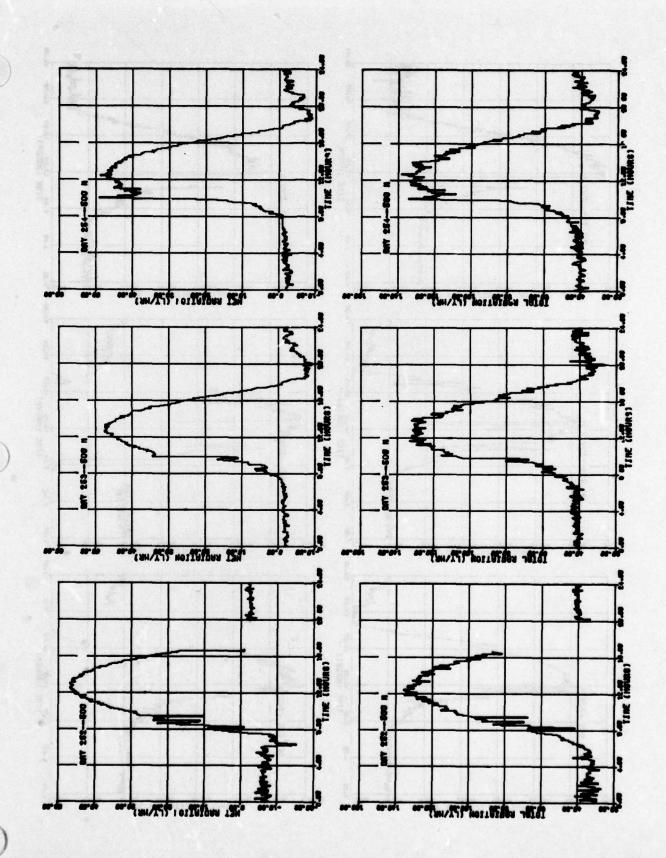


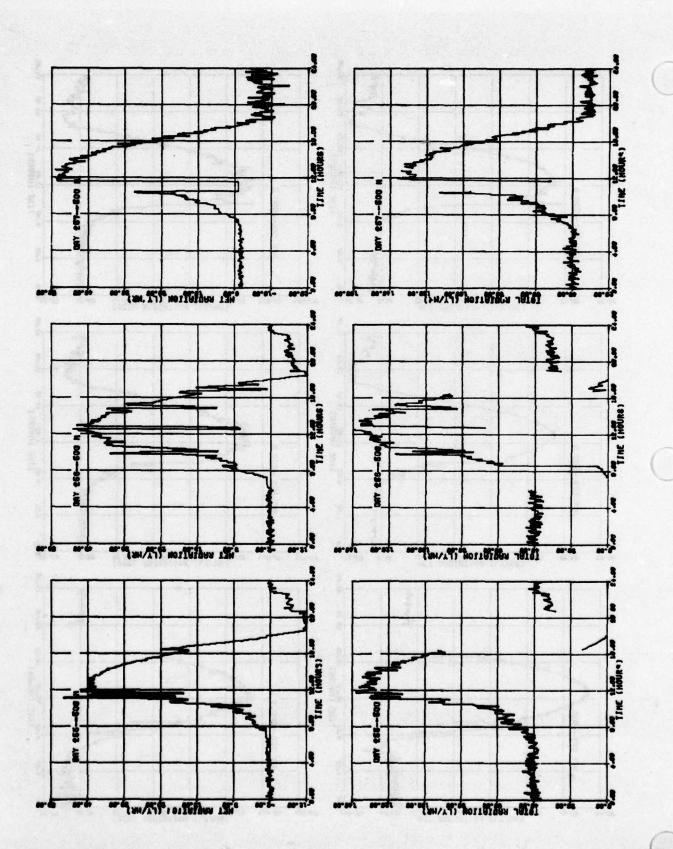


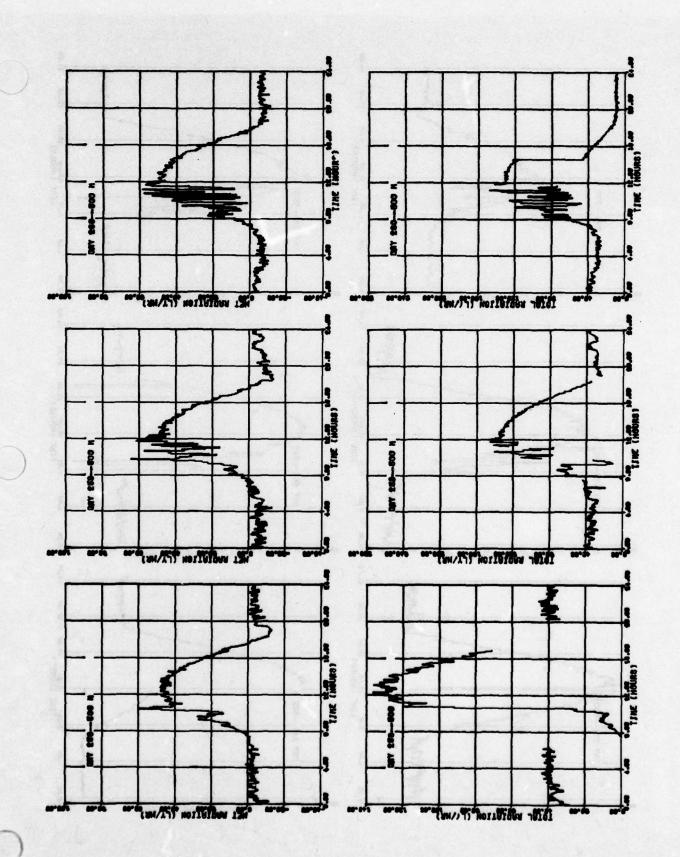


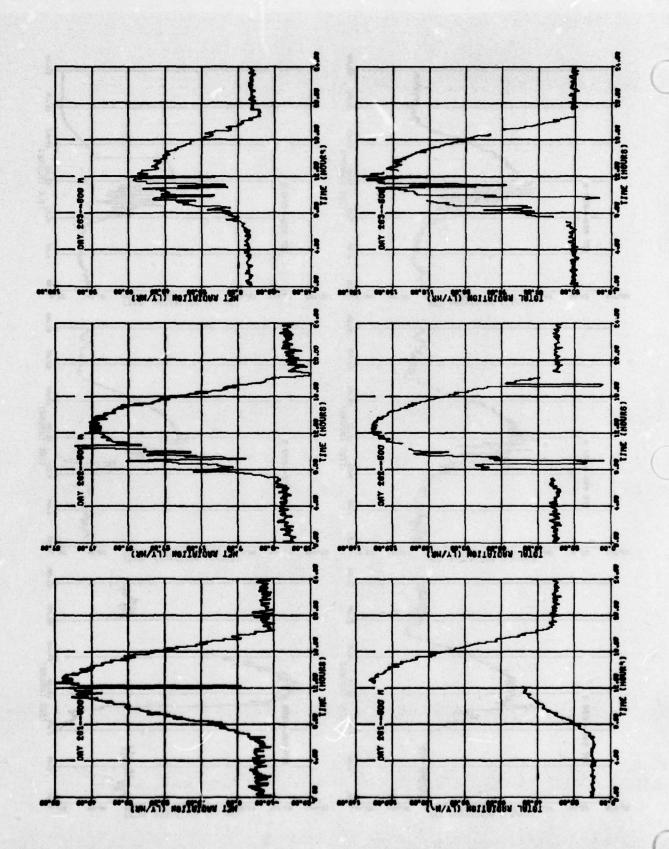


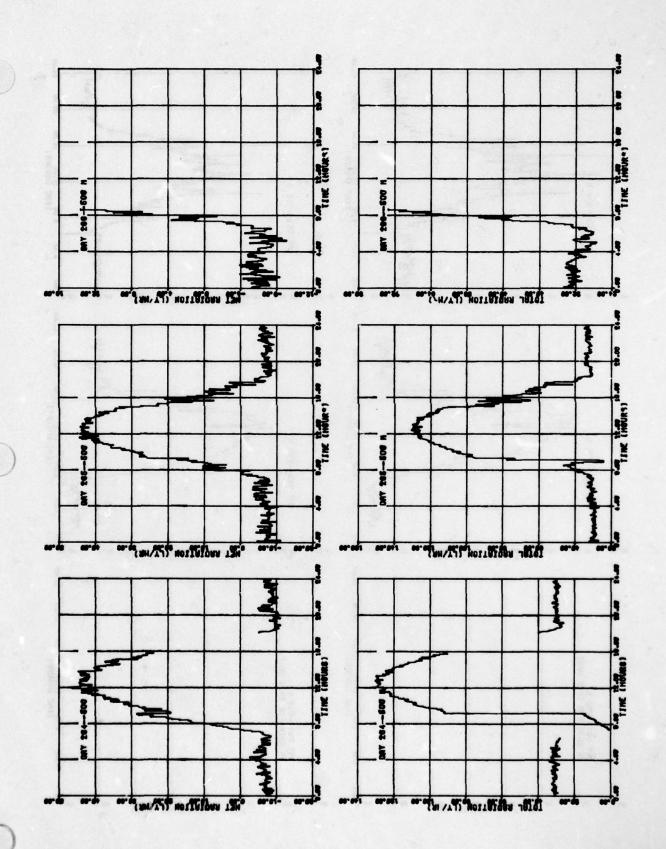


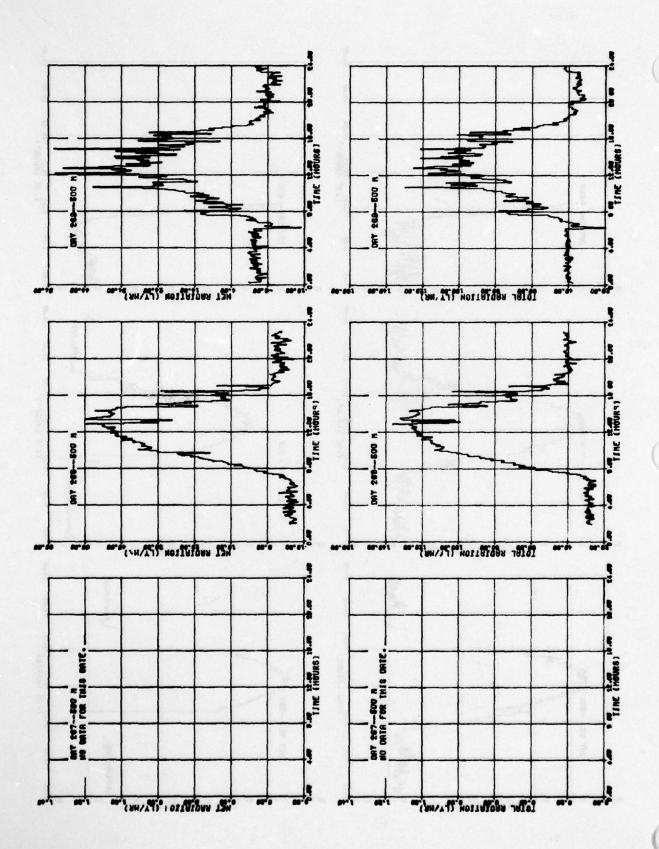


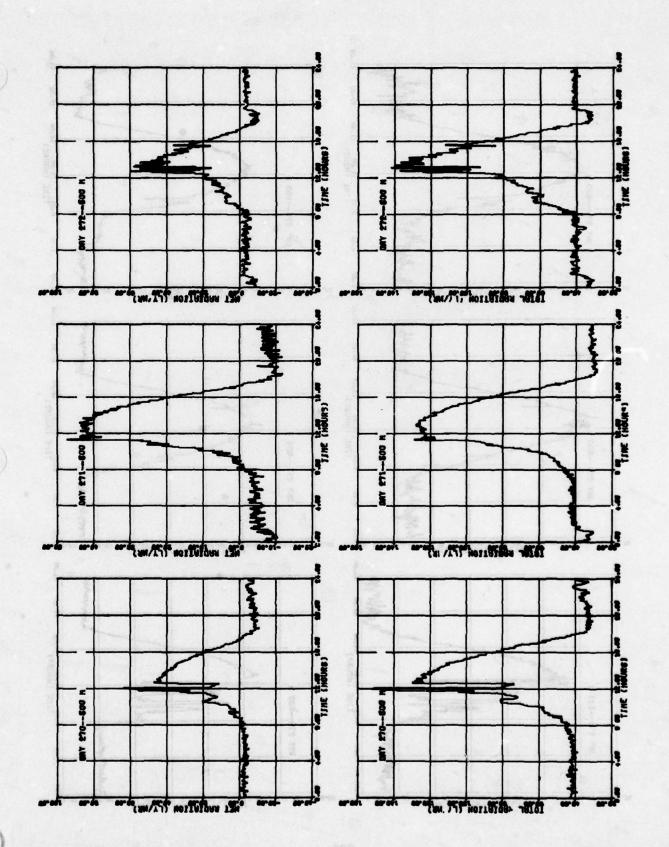


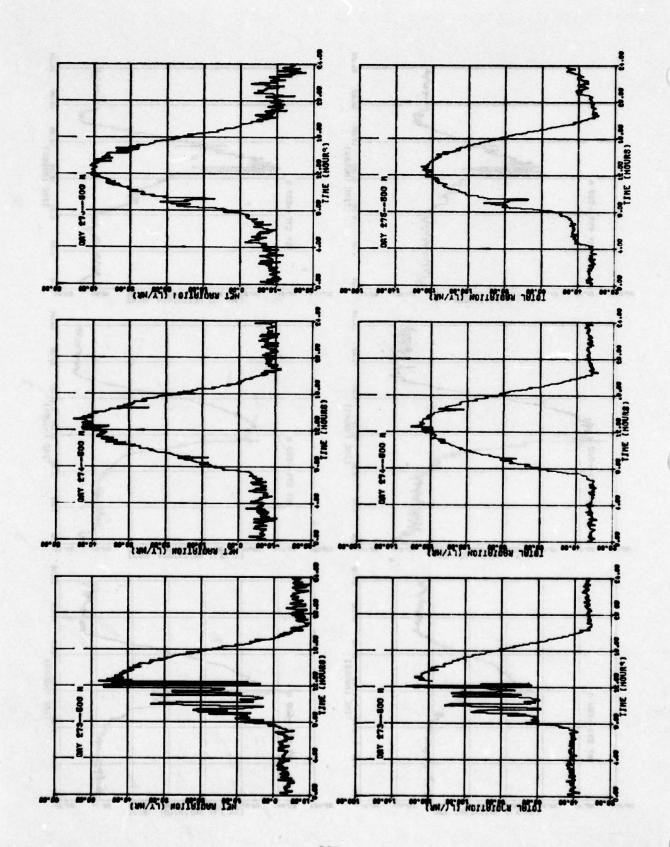


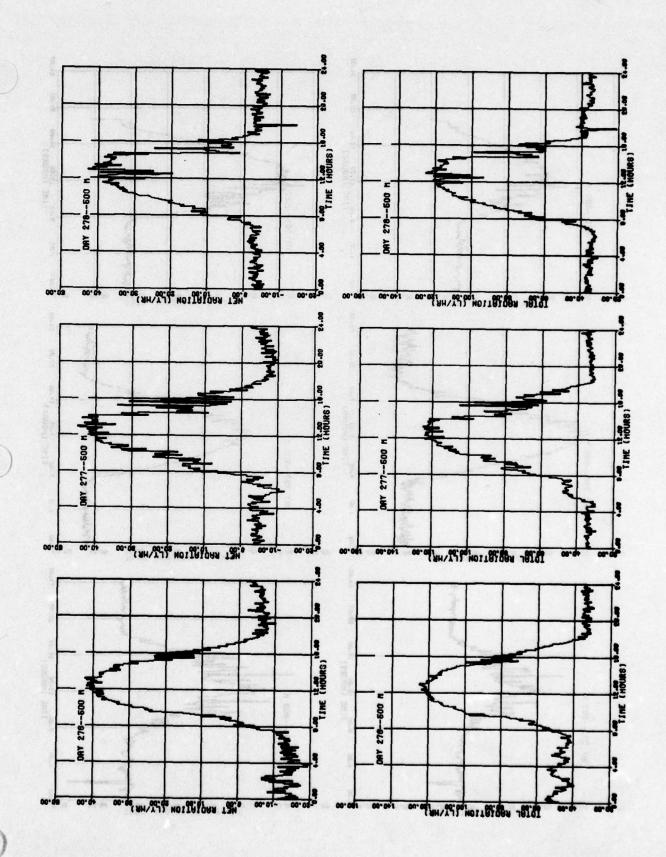


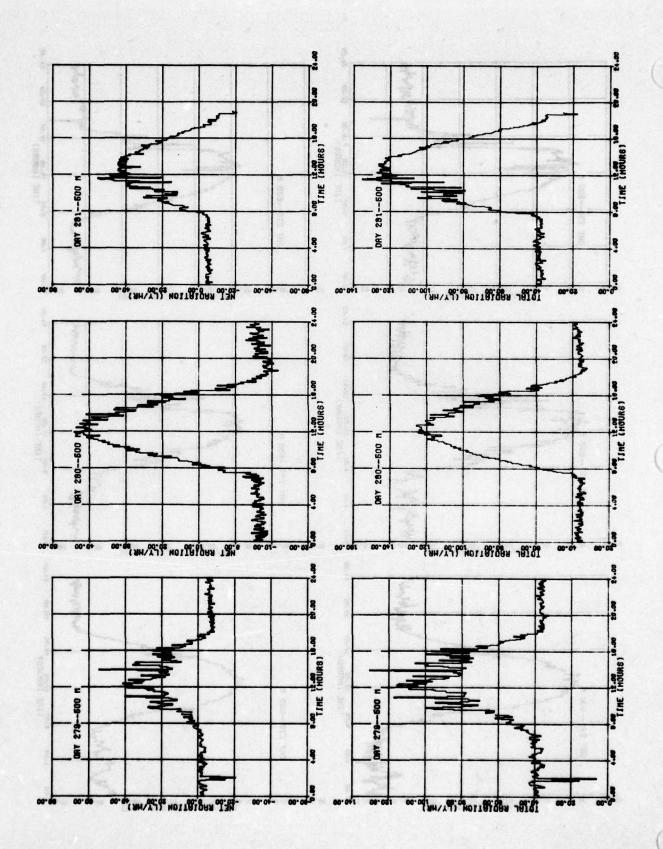


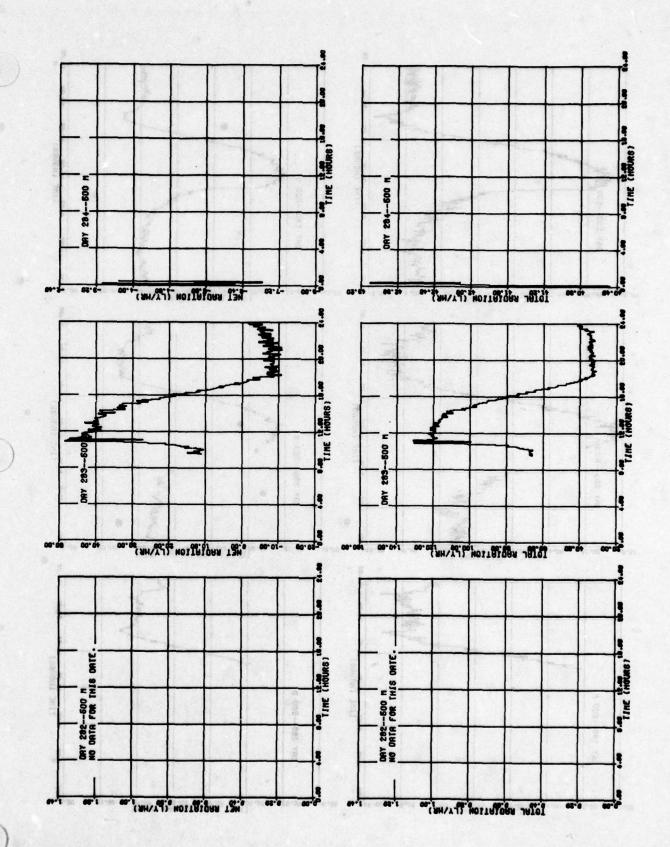


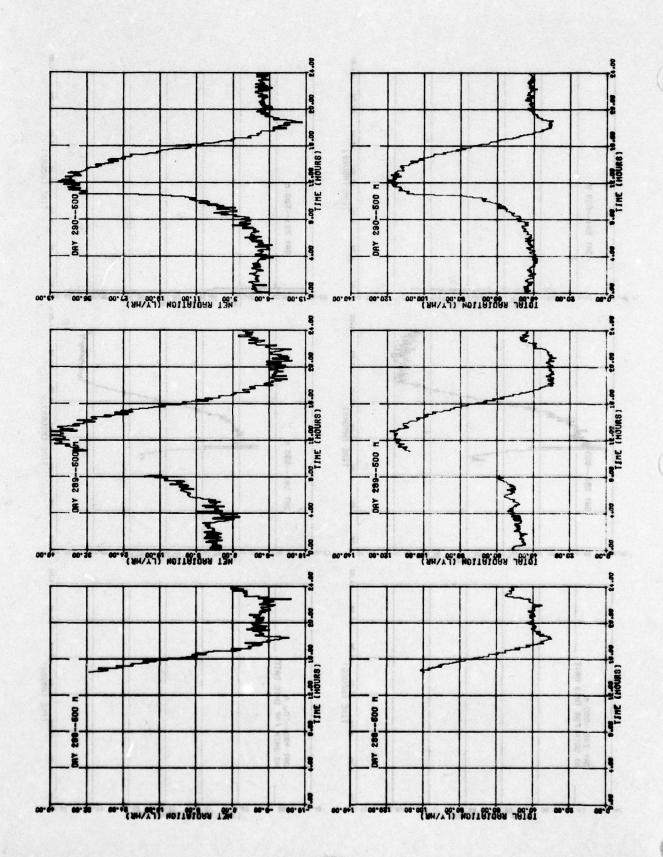


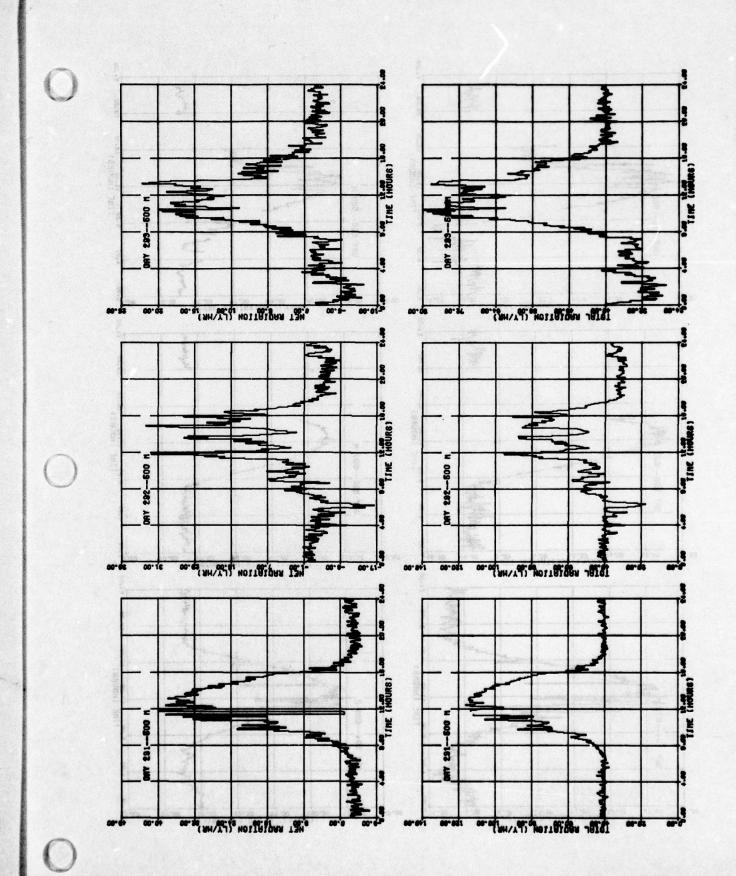


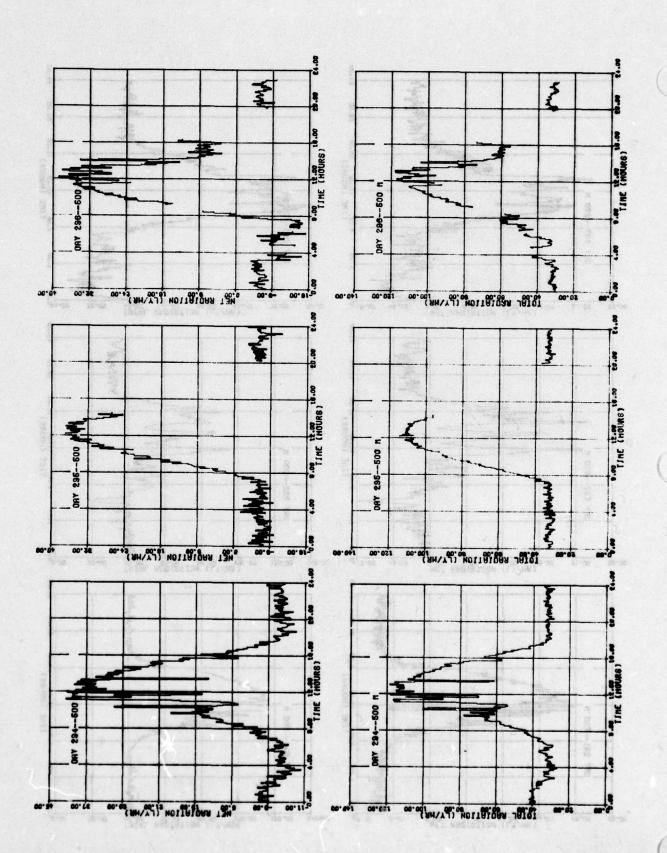


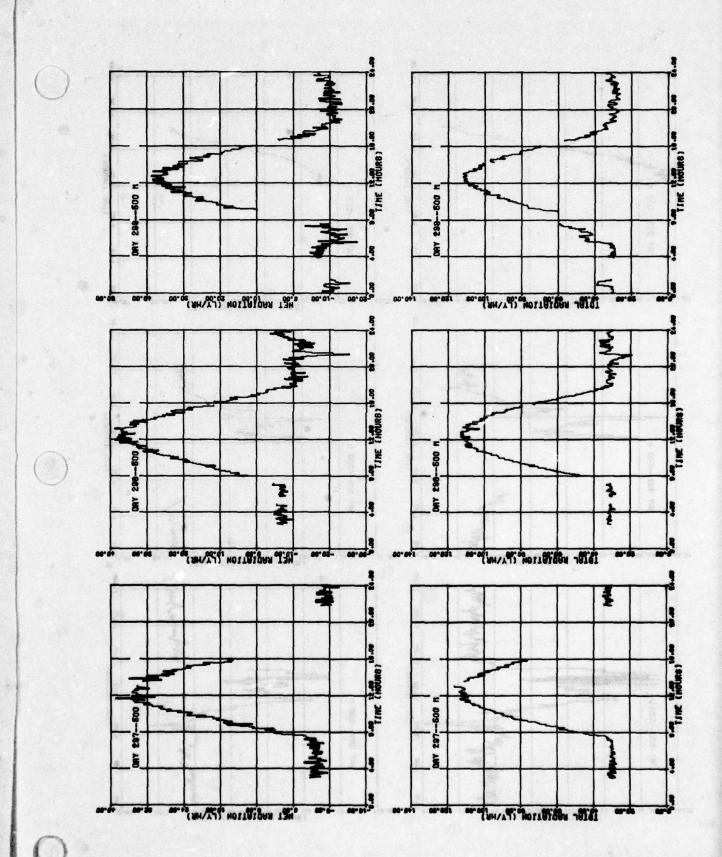


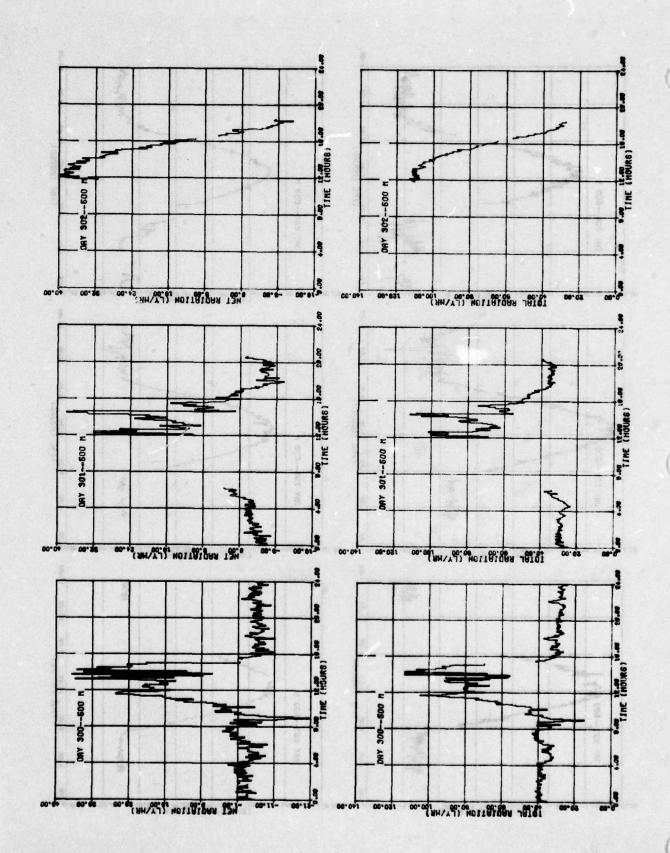


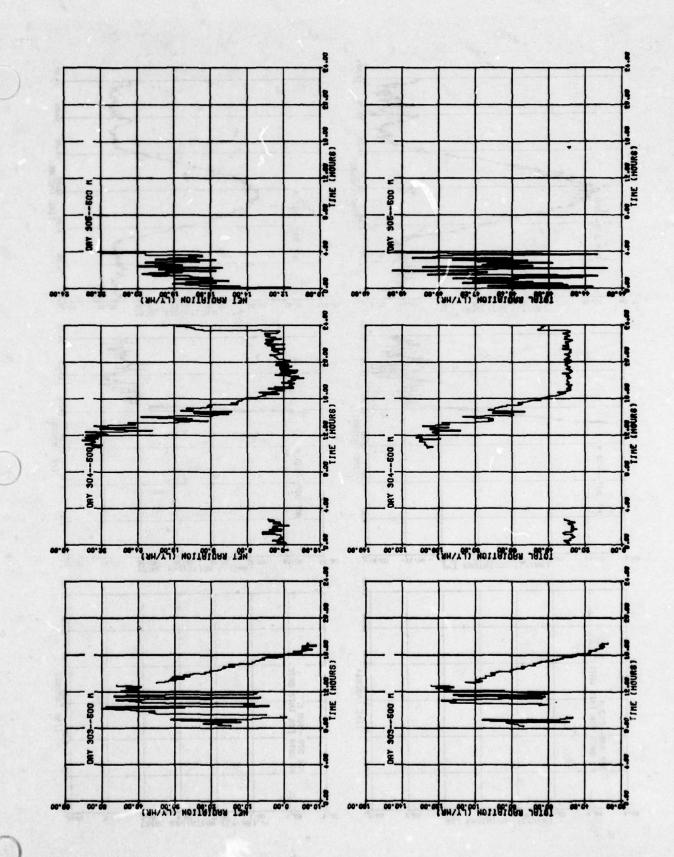


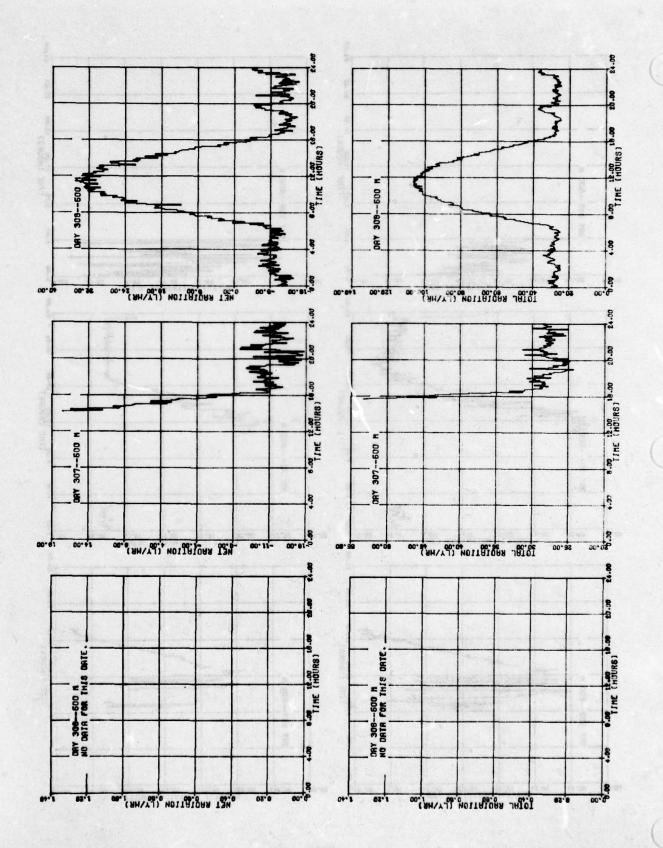


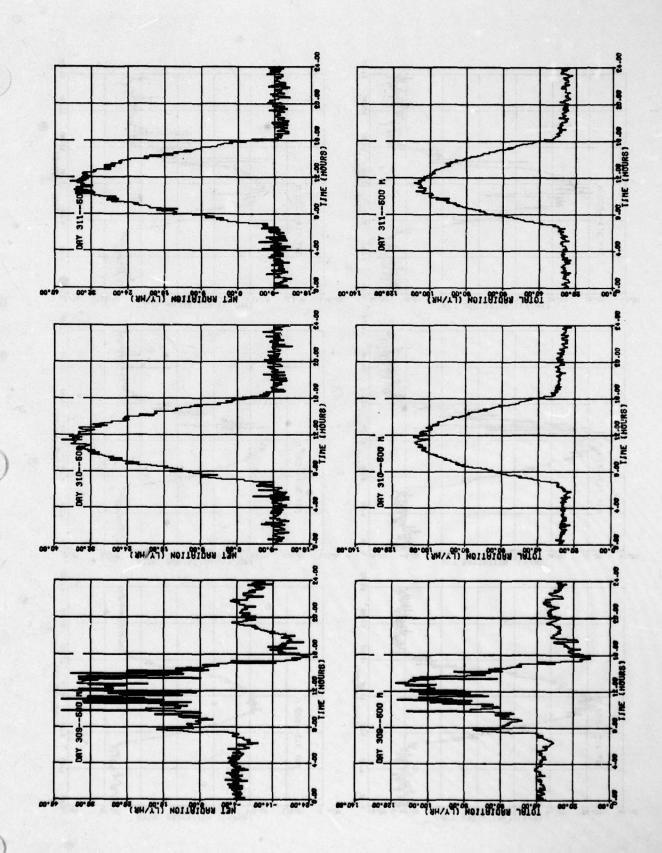


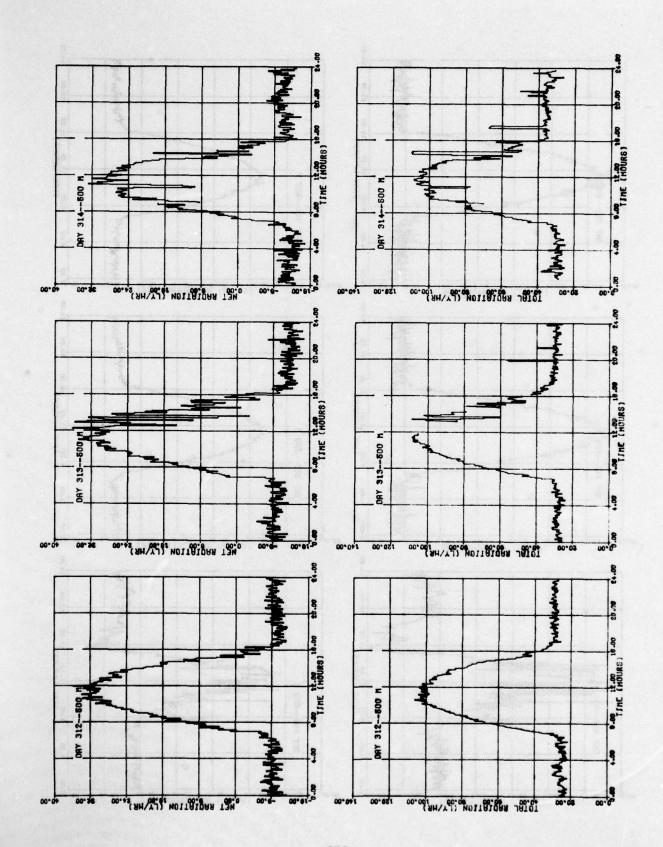


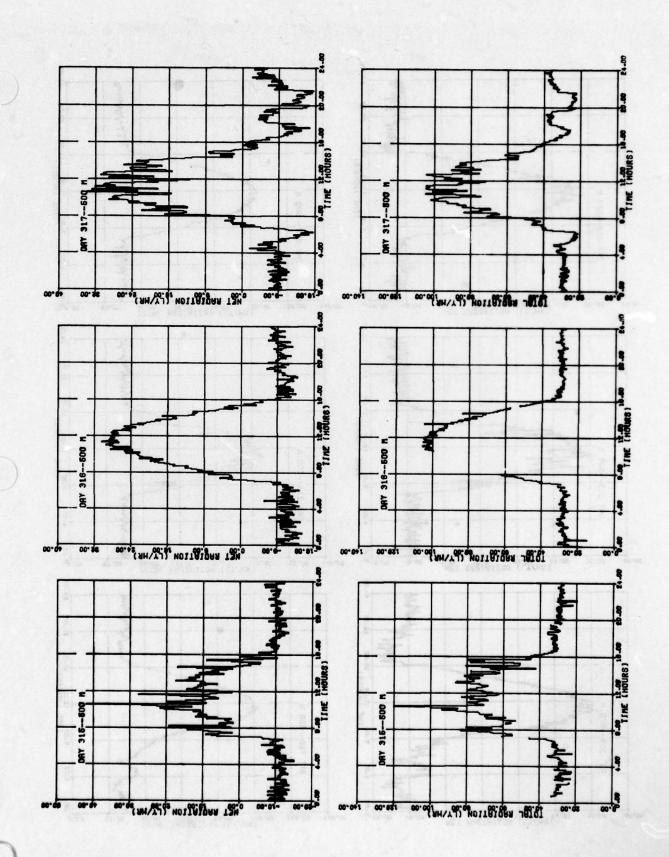


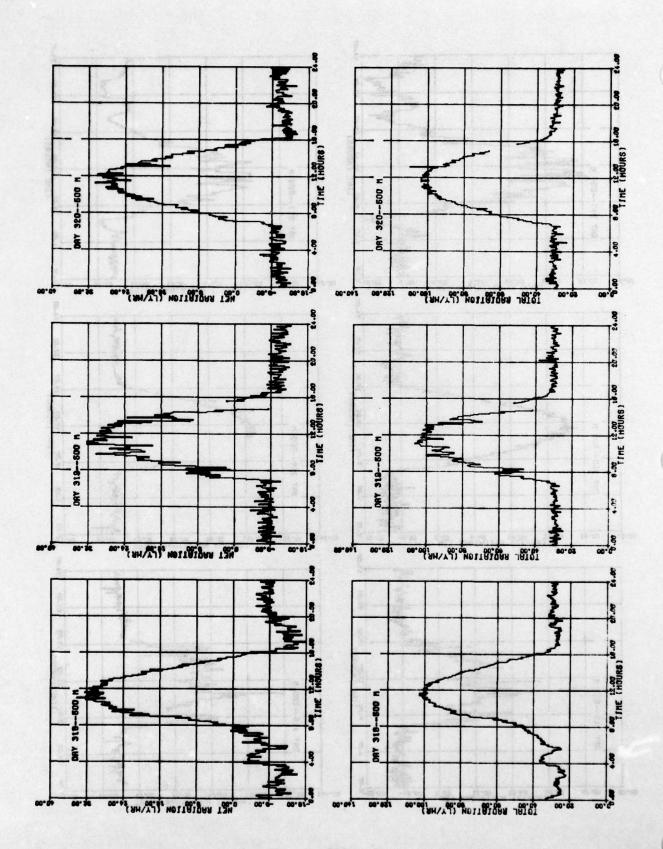


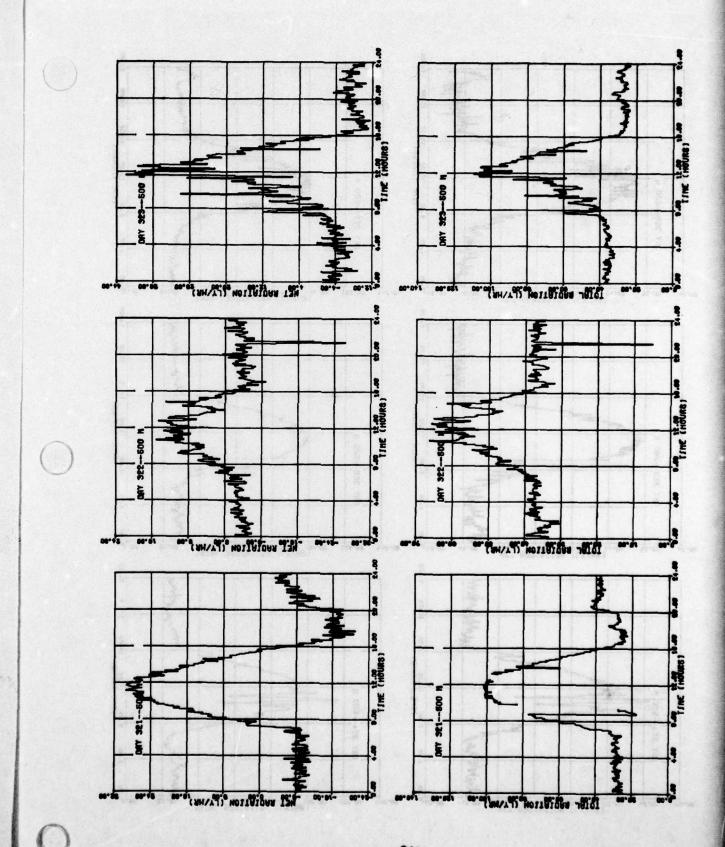


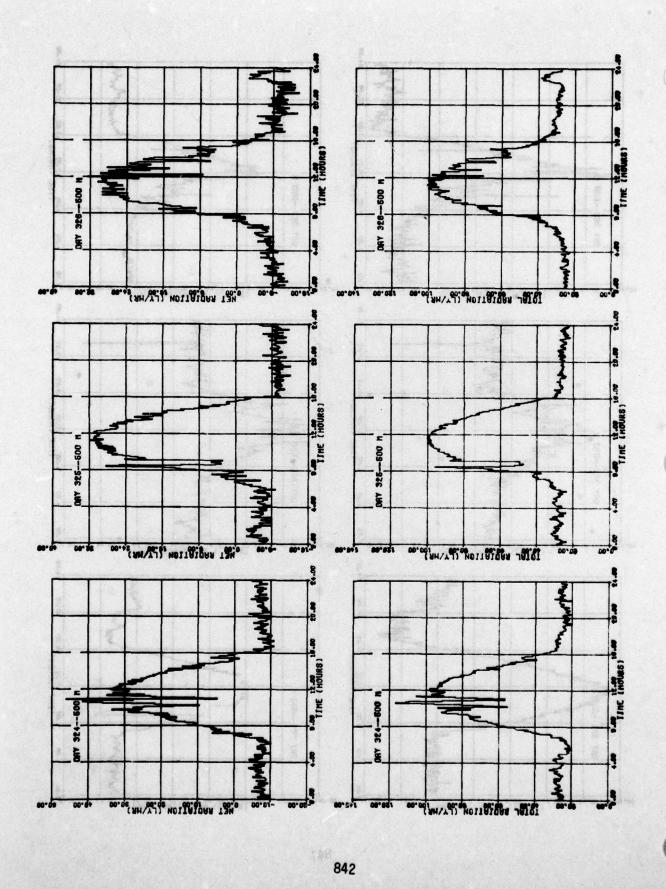


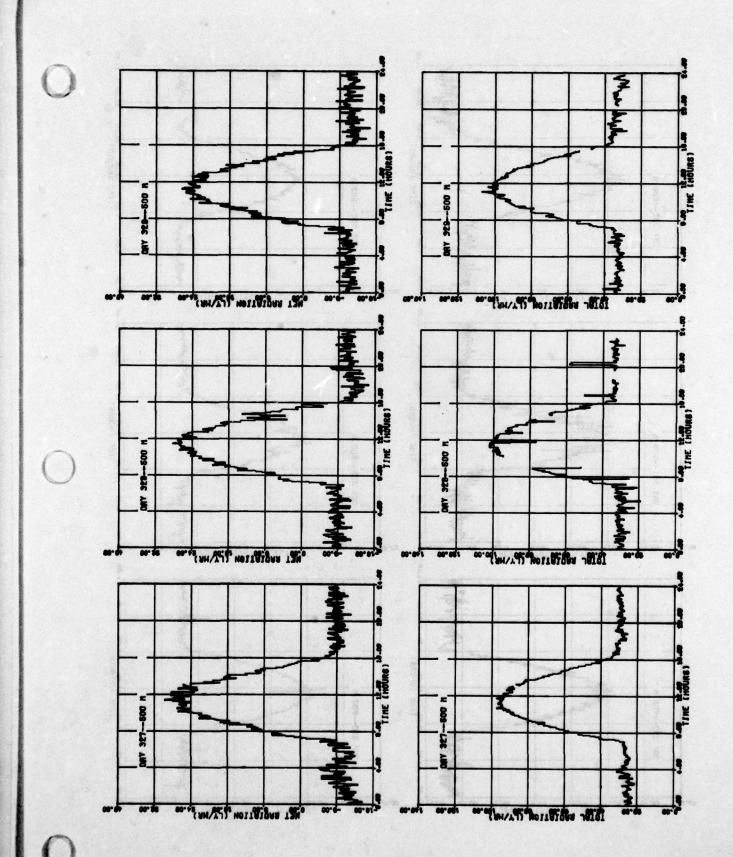


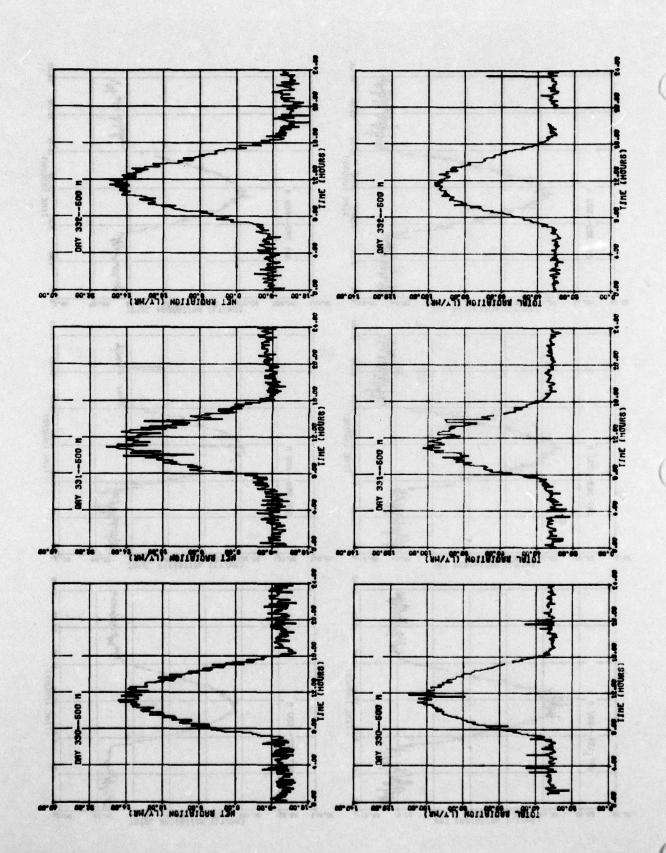


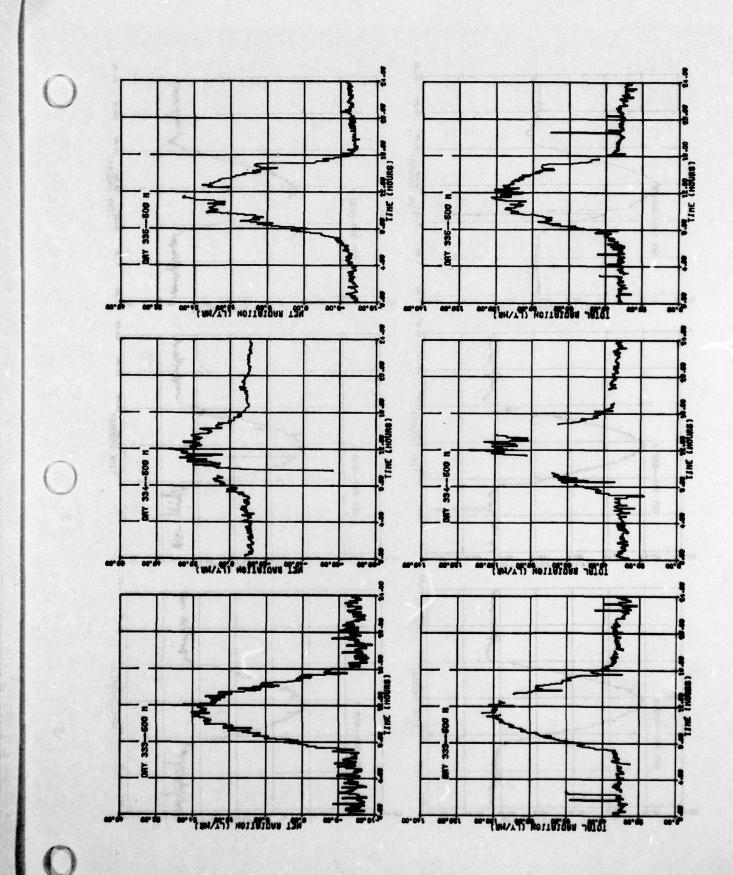


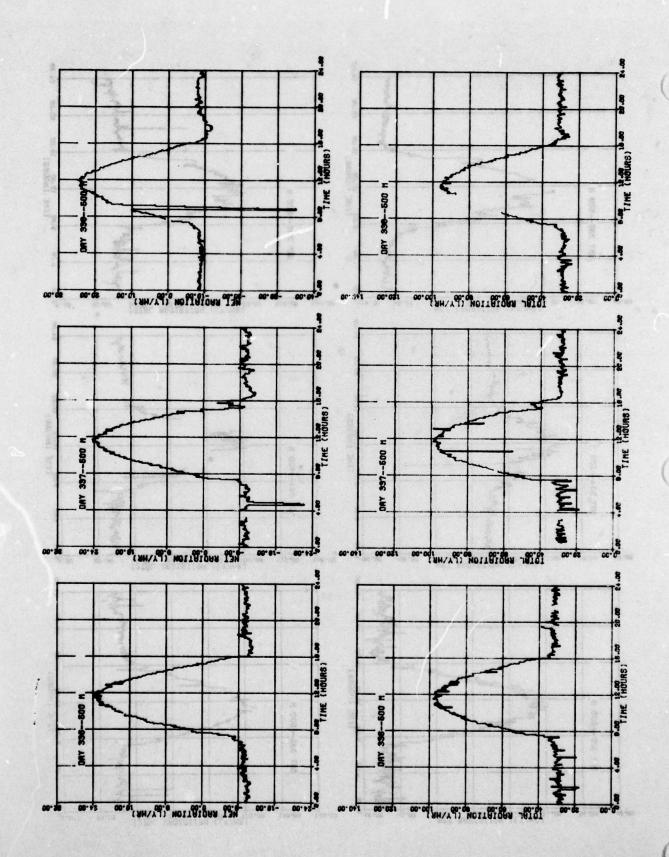


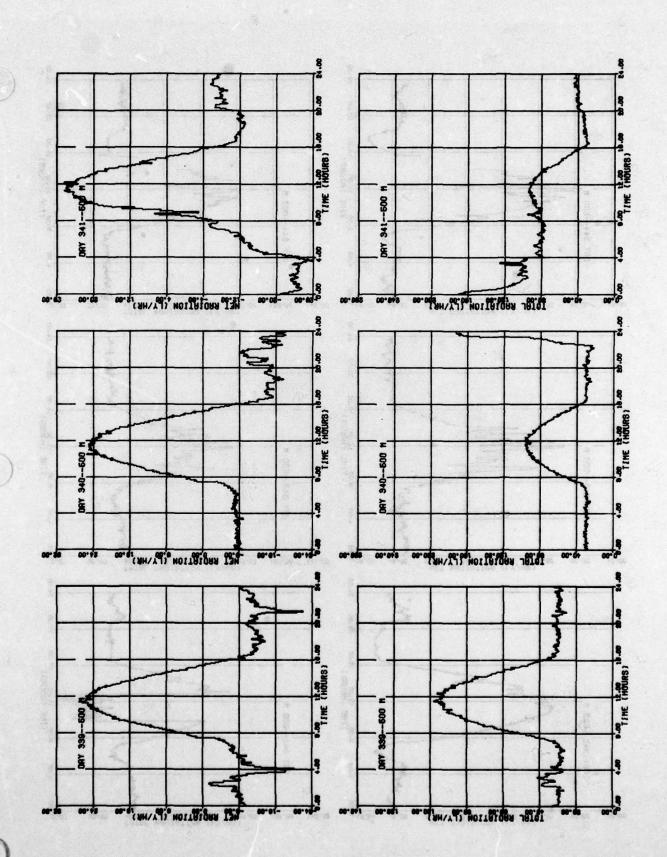


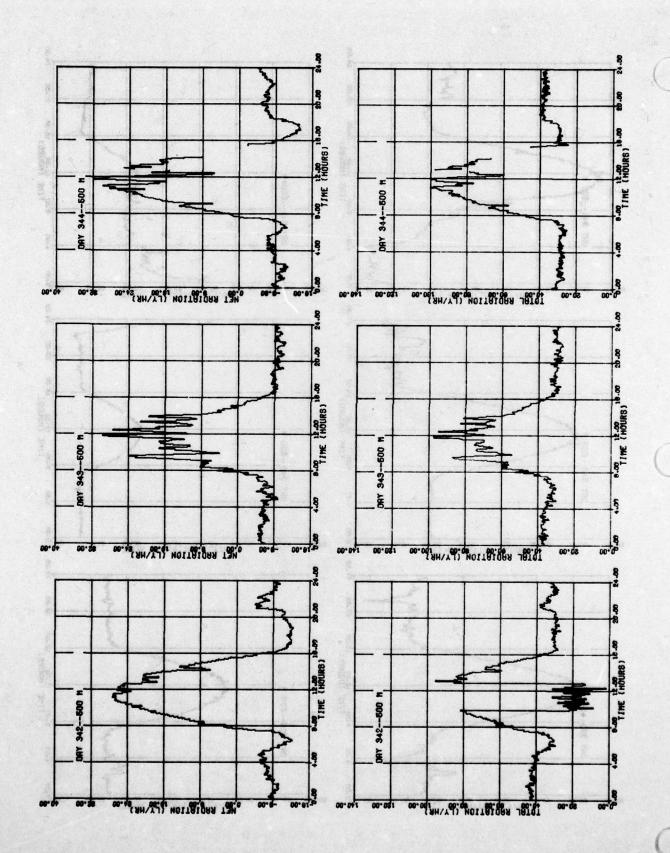


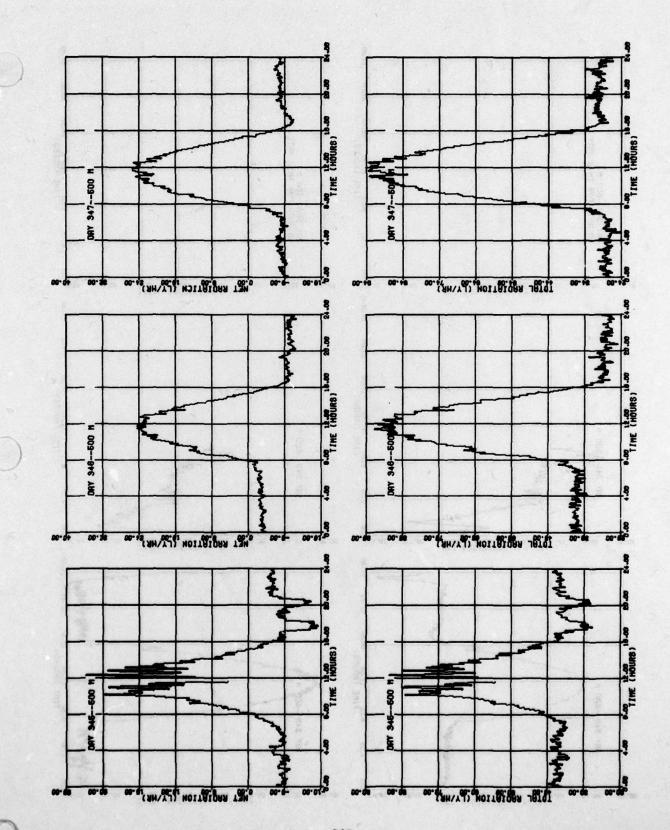


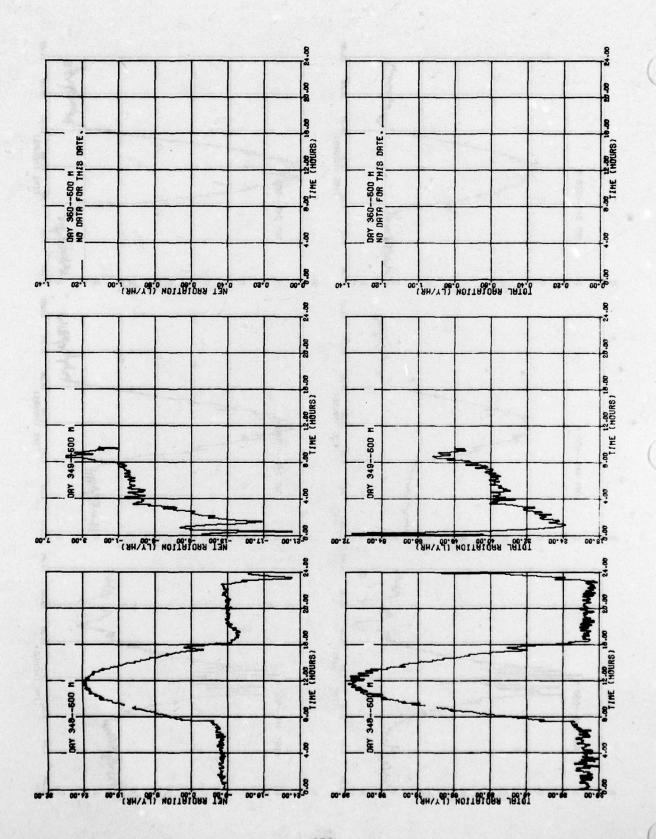












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